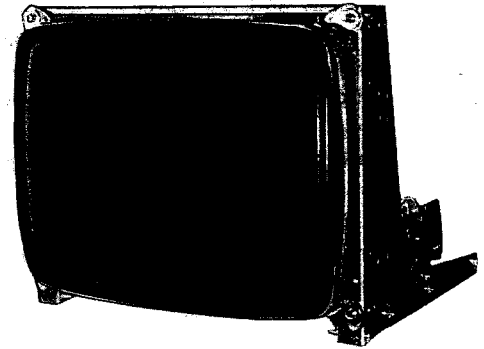


Service Manual

Color CRT Display
MODEL TX-1413FHE

Chassis No. X13



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Panasonic®

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

SAFETY PRECAUTIONS

1 CAUTION

No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guide lines.

2 SAFETY CHECK

Care should be taken while servicing this CRT display because of the high voltage used in the deflection circuits. These voltages are exposed in such areas as the associated flyback and yoke circuits.

3 FIRE & SHOCK HAZARD

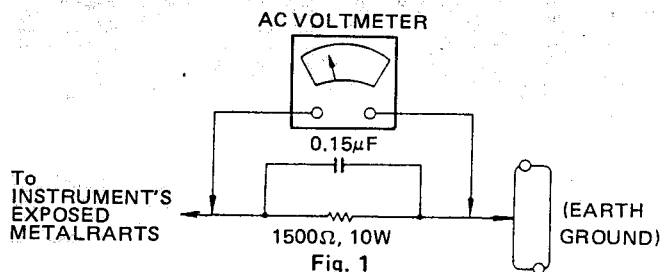
- 3-1 Insert an isolation transformer between the CRT display and AC power line before servicing chassis.
- 3-2 In servicing pay attention to original lead dress especially in the high voltage circuit. If a short circuit is found, replace all parts which have been overheated as a result of the short circuit.
- 3-3 All the protective devices must be reinstalled per original design.
- 3-4 Soldering must be inspected for possibly cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all foreign material.

4 LEAKAGE CURRENT COLD CHECK

- 4-1 Unplug the AC cord and connect a jumper between the two prongs on the plug.
- 4-2 Turn the CRT display power switch on.
- 4-3 Measure the resistance value with an ohmmeter between the jumpered AC plug and each exposed metallic part on the CRT display such as metal frame screwhead, control shafts, etc. When the exposed metallic part has a return path to the chassis, the reading should be 1.8 megohm minimum.

5 LEAKAGE CURRENT HOT CHECK

- 5-1 Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during this check.
- 5-2 Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15 μ F capacitor between each exposed metallic part and good earth ground (as shown in Fig. 1).
- 5-3 Use an AC voltmeter with 1000 ohm/volt or more sensitivity and measure the AC voltage across the combination 1500 ohm resistor and 0.15 μ F capacitor.
- 5-4 Move the resistor connection to each exposed metallic part and measure the voltage.
- 5-5 Reverse the polarity of the AC plug in the AC outlet and repeat the above measurement.
- 5-6 Voltage measured must not exceed 7.5 volt RMS, from any exposed metallic part to ground.
A leakage current tester may be used in the above hot check, in which case any current measured must not exceed 5.0 milliamp. In the case of a measurement exceeding the 5.0 milliamp value, a rework is required to eliminate the chance of a shock hazard.



Note: High voltage is present when this CRT display is operating. Always discharge the anode of the picture tube to the display chassis to prevent shock hazard.

6 IMPLOSION PROTECTION

All Panasonic picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage and scratching during installation. Use only Panasonic replacement picture tubes.

7 X-RADIATION

WARNING: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level.

Note: It is important to use an accurate periodically calibrated high voltage meter.

- 7-1 To measure the high voltage, use a high impedance high voltage meter, connect (—) to the external conductive coating (aquadag) of CRT and (+) to the CRT anode button.
- 7-2 Turn the Brightness control fully counterclockwise.
- 7-3 Measure the high voltage. The high voltage meter should indicate at the following factory-recommended level.
- 7-4 If the upper meter indication exceeds the maximum level, immediate service is required to prevent the possibility of premature component failure.
- 7-5 To prevent X-Radiation possibility, it is essential to use the specified picture tube.
- 7-6 The nominal high voltage is 24kV and must not exceed 28kV at zero beam current at rated voltage.

IMPORTANT SAFETY NOTICE

There are special components used in this CRT Display which are important for safety. These parts are identified by the international symbol Δ on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacture's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without written permission of the Matsushita Electric or this will void the original parts and labor guarantee.

GENERAL INFORMATION

- Here is an outline of model TX-1413FHE.
- This model is COLOR CRT DISPLAY of metal frame type.
- TX-1413FHE uses high resolution (Dot pitch 0.31mm) R.G.B. short persistence Color Cathode Ray Tube.
- The input signals are separate type and each is applied through the 9 pin D-subminiature connector.
- Input signals are TTL level.
- TX-1413FHE can display up to 16 colors including black.
- A switching regulator circuit is applied to the power supply of this model. It is available for AC input 198 ~ 264V.
- In order to meet users' requirements, frame mechanism is employed for easy adjustment of CRT setting angle.
- Angle can be changed by stages such as 0°, 2.5°, 7.5° and 10°.

SPECIFICATIONS

1. MECHANICAL DESCRIPTION

Dimension

Height: 287 mm typ.
Width: 330 mm typ.
Depth: 370 mm typ.
Weight: 10 kg

Cathod-Ray Tube: 370MYB22N

Size 14"
Gun In — Line
Def. Angle 90°
Neck dia. 29 mm
Phosphor P22 (R.G.B)
Faceplate Dark Body, Direct Etch.

Tilt: 0°

2. ENVIRONMENT

Ambient temp, Humidity and Altitude:

Operating

Temp: 0° ~ 50°C
Humidity: 5 ~ 90%
Altitude: 10,000 FT max. (3,000m)

Non-operating

Temp: -40° ~ 65°C
Humidity: 5 ~ 90%
Altitude: 40,000 FT max. (12,000m)

Storage and Shipment

Temp: -40° ~ 65°C
Humidity: 5 ~ 90%
Altitude: 40,000 FT max. (12,000m)

Vibration and Shock (Packaged condition)

Vibration:

Frequency: 5 ~ 55 Hz
Vertical: 1.25 G
Horizontal: 0.75 G

Shock:

Corner and Edge: Height 40 cm
Front, Back,
Side and Bottom: Height 50 cm

3. ELECTRIC PERFORMANCE

Power supply

Input Voltage: AC198 ~ 264V

Input Frequency: 48 to 62 Hz

Input Current: 0.5A max. (at 220V AC)

Power: 60W max.

Inrush Current: 60A0-p max. (at 220V AC)

Input Signals

Horizontal Sync:

Polarity: Positive
Signal Level: 4Vp-p ±1V
Input Imp.: 1K ohms

Vertical Sync:

Polarity: Positive
Signal Level: 4Vp-p ±1V
Input Imp.: 1K ohms

Video Signal (R.G.B.I): (See Note 1)

Polarity: Positive
Signal Level: 4Vp-p (See Note 2)
Tr, Tf: ≤10nS

Note 1. Max rise and fall times (from 10% to 90%) of input signals are less than 10nS.

Note 2. Color Function Table (16 colors)

16 colors					Output level			Color name	Cont.	Bright
No.	I	R	G	B	R %	G %	B %			
1	0	0	0	0	0	0	0	Black	X	○
2	0	0	0	1	0	0	66	Blue	○	○
3	0	0	1	0	0	66	0	Green	○	○
4	0	0	1	1	0	66	66	Cyan	○	○
5	0	1	0	0	66	0	0	Red	○	○
6	0	1	0	1	66	0	66	Magenta	○	○
7	0	1	1	0	66	66	0	Yellow	○	○
8	0	1	1	1	66	66	66	Light gray	○	○
9	1	0	0	0	33	33	33	Dark Gray	X	○
10	1	0	0	1	33	33	100	Light Blue	X	○
11	1	0	1	0	33	100	33	Light Green	X	○
12	1	0	1	1	33	100	100	Light Cyan	X	○
13	1	1	0	0	100	33	33	Light Red	X	○
14	1	1	0	1	100	33	100	Light Magneta	X	○
15	1	1	1	0	100	100	33	Light Yellow	X	○
16	1	1	1	1	100	100	100	White	X	○

Image test Condition

Character: "H"
Color: Green
Brightness: Max. (without Background)
View Direction: Parallel to the CRT axis
Ambient
Temperature: Room Temperature
Supply Voltage: AC220V

- Note 3. Measure more than 20 minutes after power on.
- Note 4. Normal condition is the condition that satisfies image test condition. (Condition of following items is normal condition, if not mentioned).

Video Out

Turn Rise Time (Tr): Less than 40nS
 Turn Fall Time (Tf): Less than 40nS
 (Measured with 10MHz square-wave Duty 50%).

Image

Character Area:

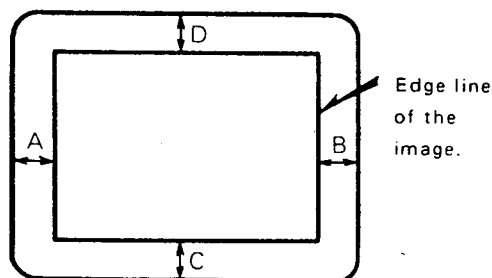
Horizontal: 240 ± 5 mm
 Vertical: 180 ± 5 mm
 Normal Condition

IMAGE POSITION:

Image position is adjustable at the center of the CRT to the dimensions below.

To be able to adjust at center of the CRT.

Image is within the area in Figure.

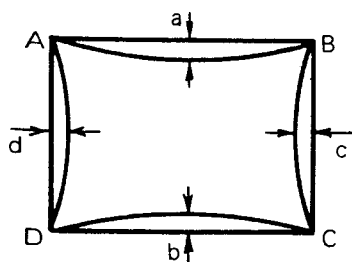


$|A-B| \leq 6$ mm
 $|C-D| \leq 6$ mm
 Normal Condition

DISTORTION:

(A) PINCUSHION

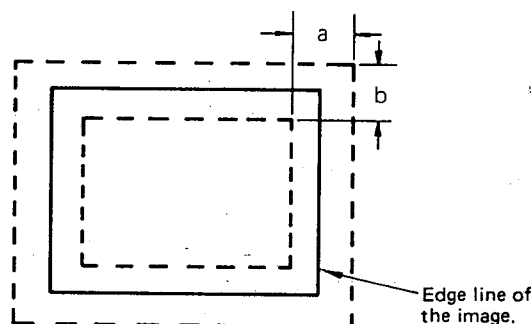
Upper: (a): Less than 2.5 mm
 Lower: (b): Less than 2.5 mm
 Right and Left (c), (d):
 Less than 2.5 mm



Input signal.....Cross-hatch
 Normal Condition

(B) RECTANGULARNESS & PARALLELOGRAM DISTORTION

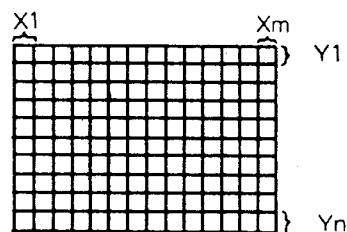
Edge of the image is within the area indicated by the dotted line in Figure.



a..... 4 mm
 b..... 4 mm
 Input signal.....Cross-hatch
 Normal Condition

(C) LINEARITY

Horizontal and vertical linearity shall be less than 7% see Figure.



Horizontal linearity

$$\frac{X_{\max} - X_{\min}}{X_{\max} + X_{\min}} \times 100(\%) \leq 7\%$$

Vertical linearity

$$\frac{Y_{\max} - Y_{\min}}{Y_{\max} + Y_{\min}} \times 100(\%) \leq 7\%$$

Note: Maximum and minimum value should not be adjacent to each other.

X max is maximum value among X1~Xm.

X min is minimum value among X1~Xm.

Y max is maximum value among Y1~Yn.

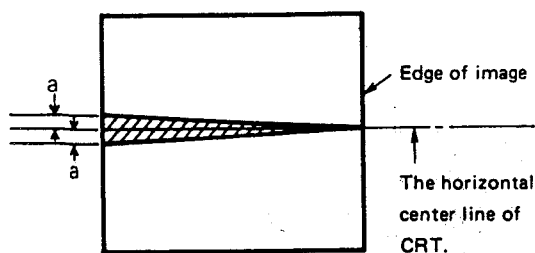
Y min is minimum value among Y1~Yn.

Input signal.... Cross-hatch.

Normal Condition

(D) ROTATION

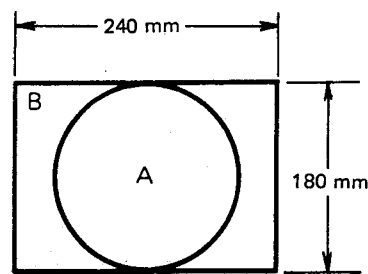
Horizontal center line of the image shall be within the shaded area in Figure.



a..... 2.5 mm

Input signal.....Cross-hatch, Green.

Normal Condition

OVERALL PERFORMANCE:**(A) MIS-CONVERGENCE**

Center of the display area

$A \leq 0.6 \text{ mm}$

Peripheral display area

$B \leq 0.8 \text{ mm}$

Note: Should be measured under the following conditions.

*Without horizontal magnetic field.(terrestrial).

*with vertical magnetic field.

*At room temperature.

*Input signal : Cross-hatch, R.G.B. mixed color.

IMAGE SIZE VARIATION:

Cause	Image size variation from the normal image size.	Range of Variation
By Brightness	Within $\pm 4 \text{ mm}$ (Horizontal and Vertical)	Max. to Min.
By Power Supply Voltage	Within $\pm 4 \text{ mm}$ (Horizontal and Vertical)	AC198 ~ 264V
By temperature	Within $\pm 4 \text{ mm}$ (Horizontal and Vertical)	$20 \pm 20^\circ \text{C}$

Normal condition, if not mentioned.

(B) RESOLUTION

Horizontal : 810 pixels

Vertical : 670 pixels

INSULATION:

More than $100 \text{ M}\Omega$

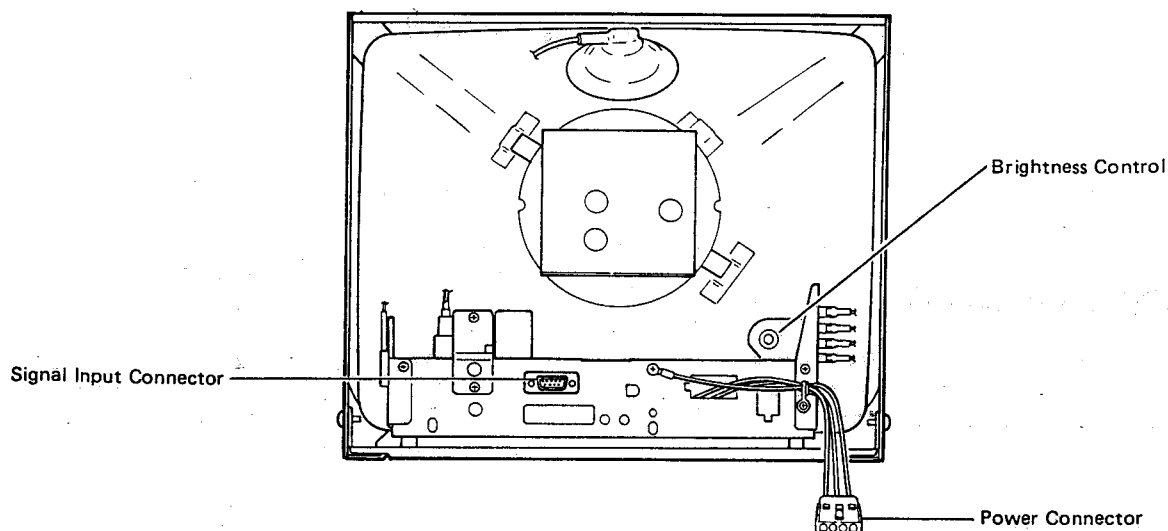
(Between AC line and Chassis)

JITTER:

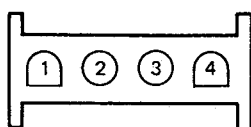
Less than 1 dot.

Invisible at a distance of 45 cm from CRT surface.

CONNECTOR AND WIRING



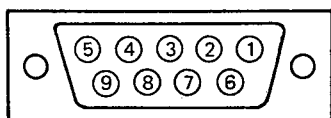
Power Connector



Pin No.	Description
1	AC (live)
2	No Connection
3	AC (neutral)
4	Frame Ground

Display Side	Customer Side
4-pole cap-housing: 350780-1	Connector: 350779-1
Pin contact: 350561-1	Contact: 350570-1
Maker: AMP Universal Mate-N-lock connector	

Signal Input Connector



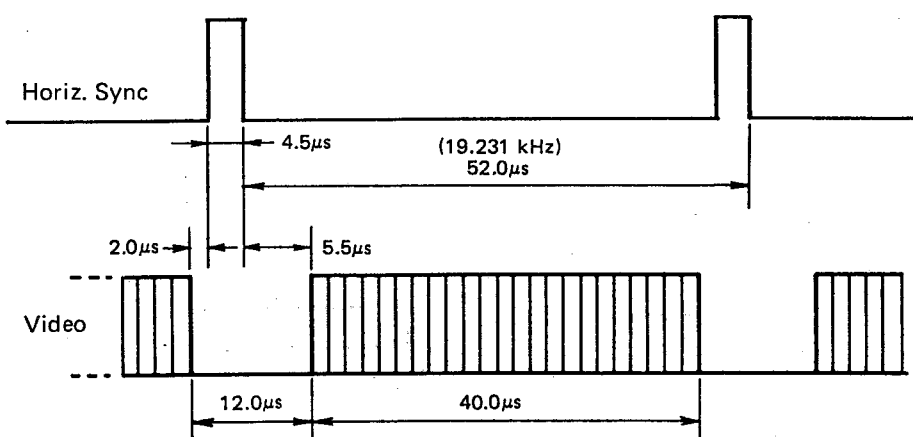
JEA 9-Pin D-subminiature Connector

Pin No.	Description
1	Signal ground
2	No Connection
3	Video (Red)
4	Video (Green)
5	Video (Blue)
6	Intensity
7	No Connection
8	H. SYNC
9	V. SYNC

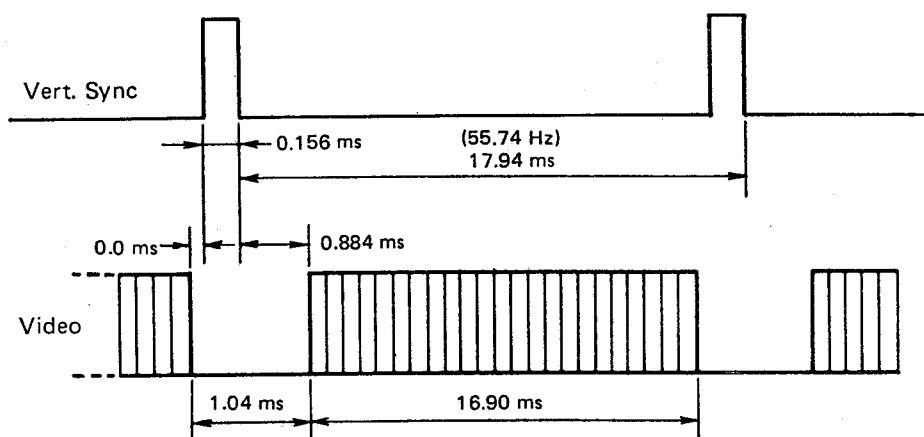
Note: The connectors of customer side are for your reference.

TIMING CHART

HORIZONTAL



VERTICAL



Note:

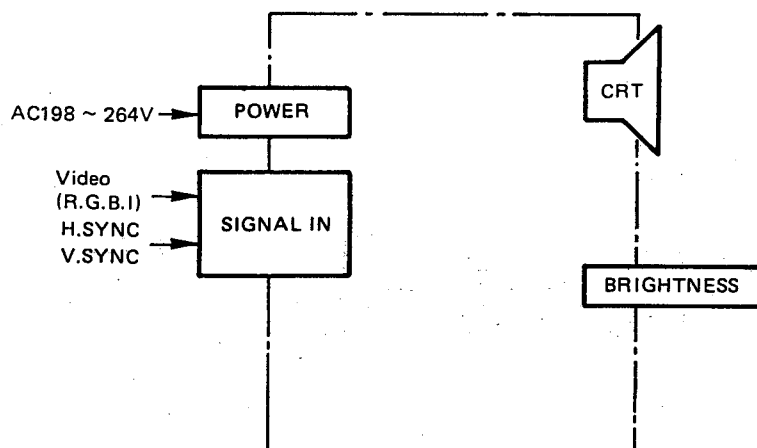
Pixel Period: 55.6 ns
 Pixel rate: 18.000 MHz
 Signal Input level: TTL level
 Time tolerance: $\pm 0.1\%$
 Scanning mode: Non-interlaced

Unit is adjusted according to this timing and frequency.

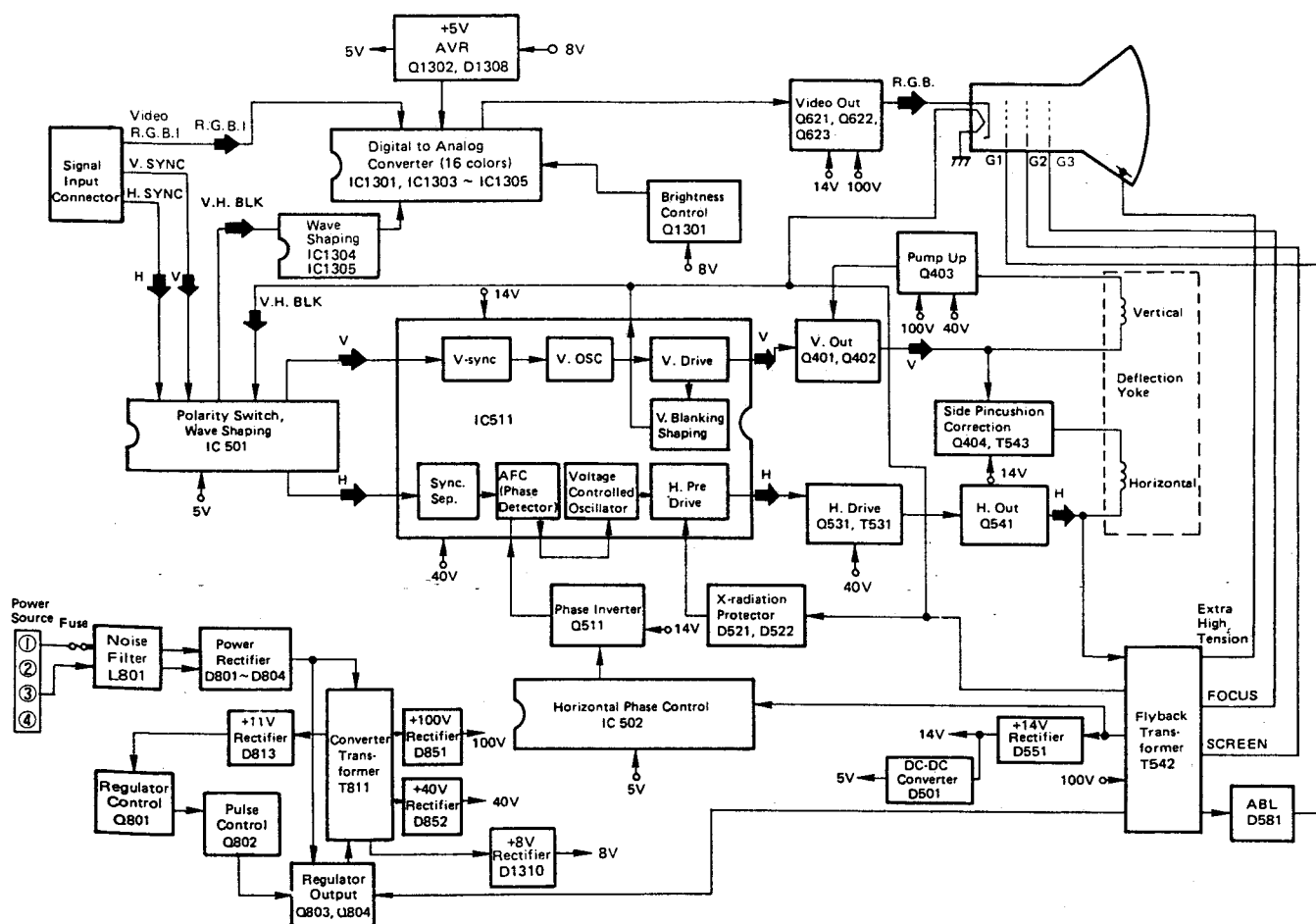
CONSTRUCTION AND BLOCK DIAGRAM

CONSTRUCTION OUTLINE

Note 1: CRT's Conducting Film (aquadag) is Connected to SG. (Signal Ground)

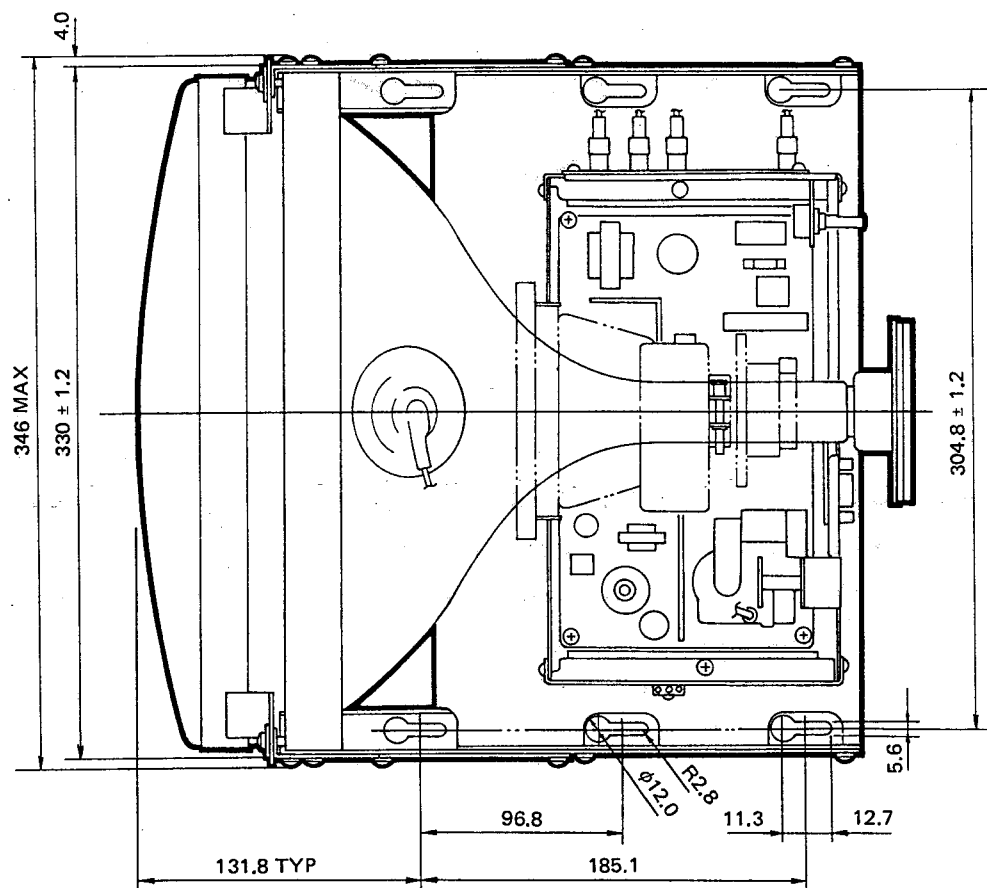
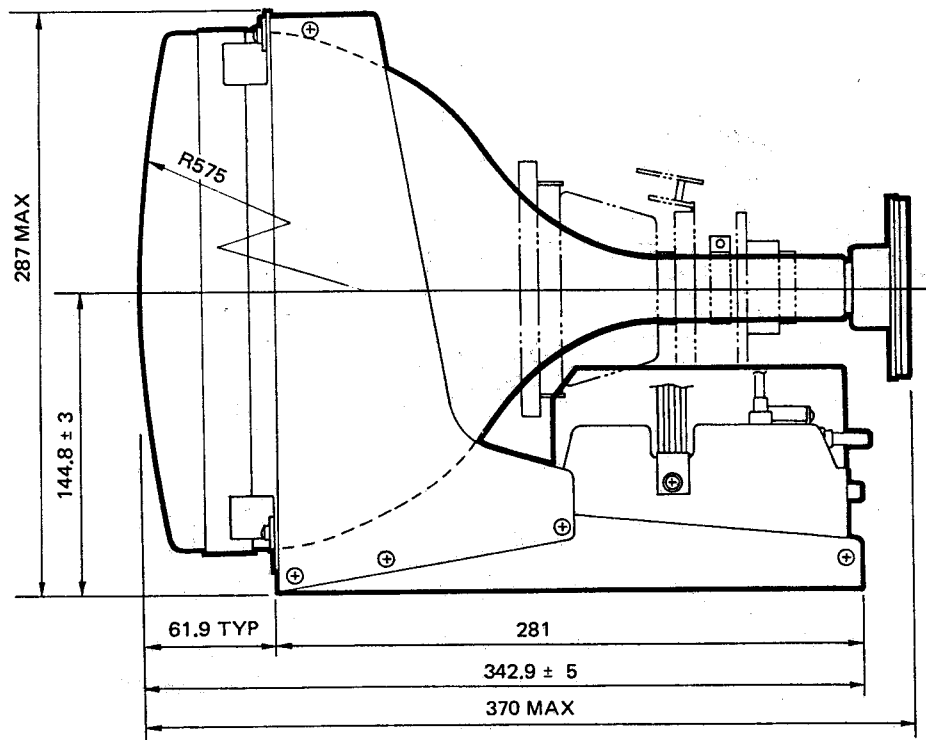


BLOCK DIAGRAM

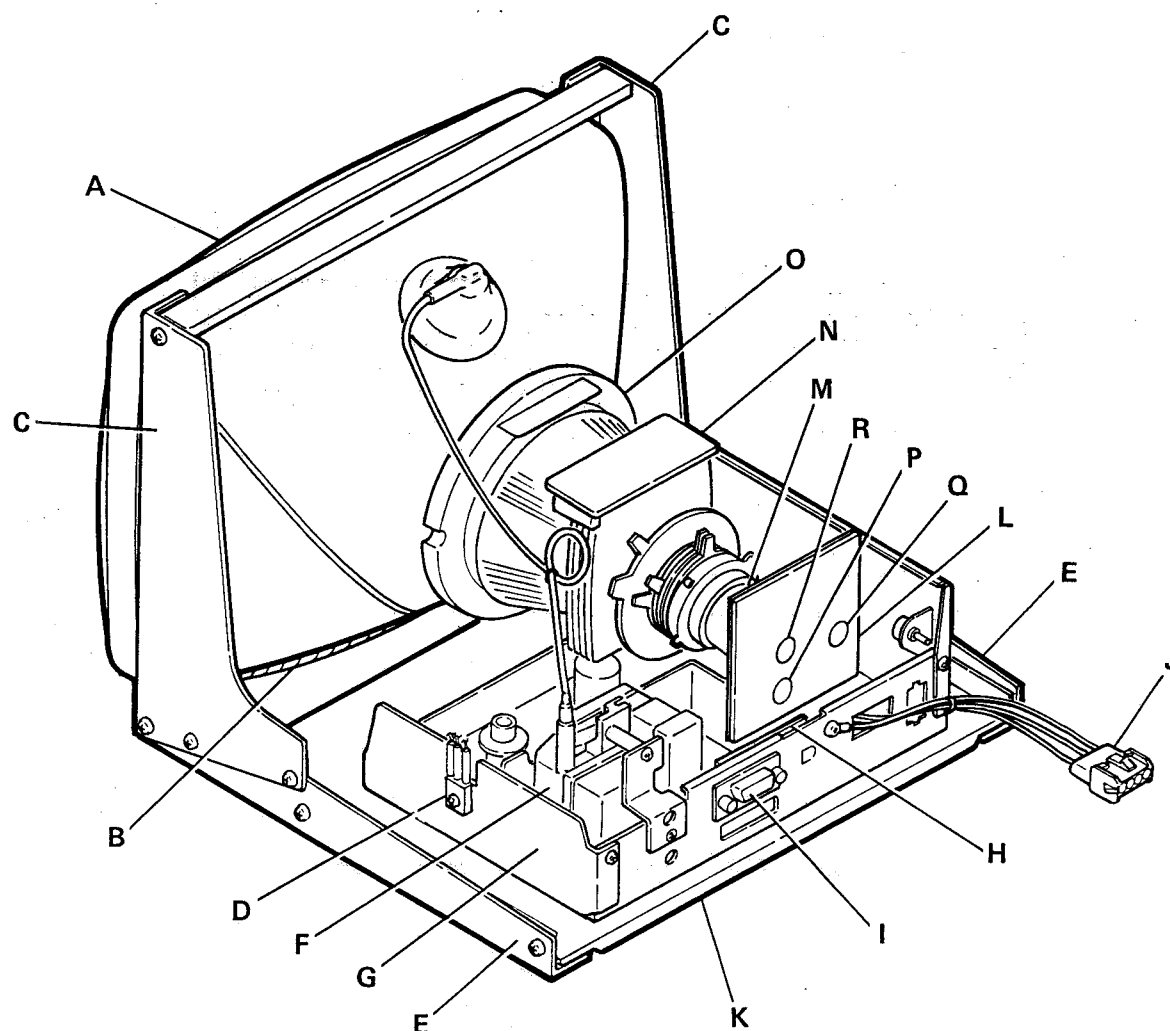


DIMENSIONS

: mm

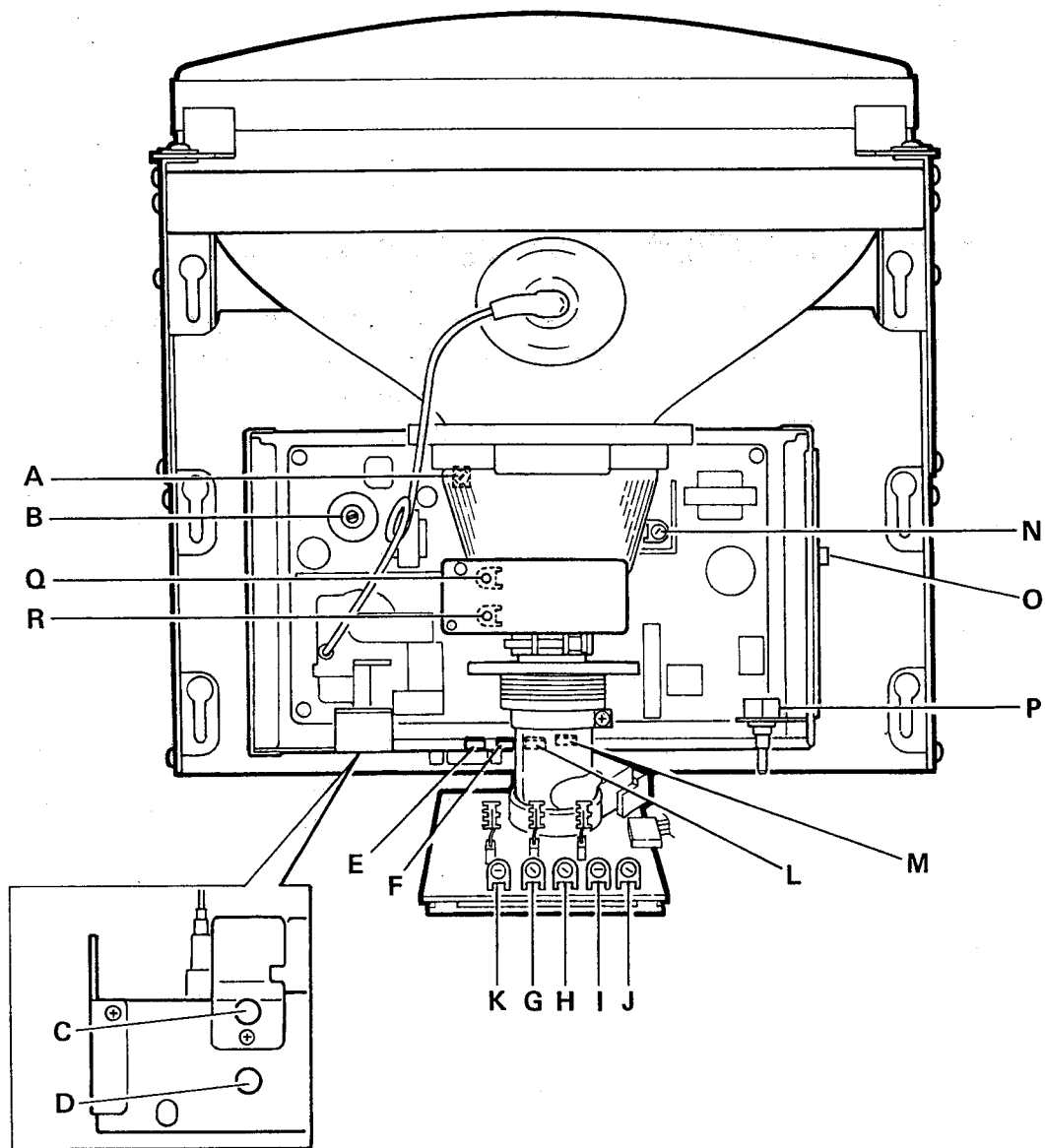


COMPONENT LOCATION



- | | | |
|---------------------------------------|--------------------------------|-------------------------|
| A . . . CRT | G . . . Heat Sink | M . . . CRT P.C.Board |
| B . . . Degaussing Coil | H . . . Signal P.C.Board | N . . . DY P.C.Board |
| C . . . Side Plate (Right and Left) | I . . . Signal Input Connector | O . . . Deflection Yoke |
| D . . . H. OUT TR (Q541) | J . . . Power Connector | P . . . TP66 (Ground) |
| E . . . Side Bracket (Right and Left) | K . . . Bottom Plate | Q . . . TP87 (100V) |
| F . . . FBT | L . . . Shield Plate | R . . . TP65 (G2) |

CONTROL LOCATION



A . . . Sub H.P.C (VR502)

B . . . Width (L542)

C . . . Focus

D . . . Screen

E . . . V. Center (VR403)

F . . . Height (VR402)

G . . . Red Drive (VR621)

H . . . Red Low (VR631)

I . . . Blue Drive (VR623)

J . . . Blue Low (VR633)

K . . . Green Low (VR632)

L . . . V. Hold (VR401)

M . . . H.Hold (VR511)

N . . . AVR (VR811)

O . . . Sub Bright (VR1301)

P . . . Bright (VR501)

Q . . . TILT (Convergence
Potentiometer) (VR452B)

R . . . AMP (Convergence
Potentiometer) (VR451B)

CAUTION FOR ADJUSTMENT AND REPAIR

1. Degaussing is inevitably required at purity adjustment or convergence adjustment.
2. At the factory a white balance meter is used. In this manual a simplified method is given.
3. If you check or adjust electrical specification or function, more than 20 minutes burn-in is required.
4. Observe proper lead dress when reassembling the unit.

CAUTION FOR SERVICING

In case of servicing or replacing CRT, high Voltage sometimes remains in the anode of CRT, So, completely discharge high voltage before servicing or replacing CRT so as to prevent a shock to the serviceman.

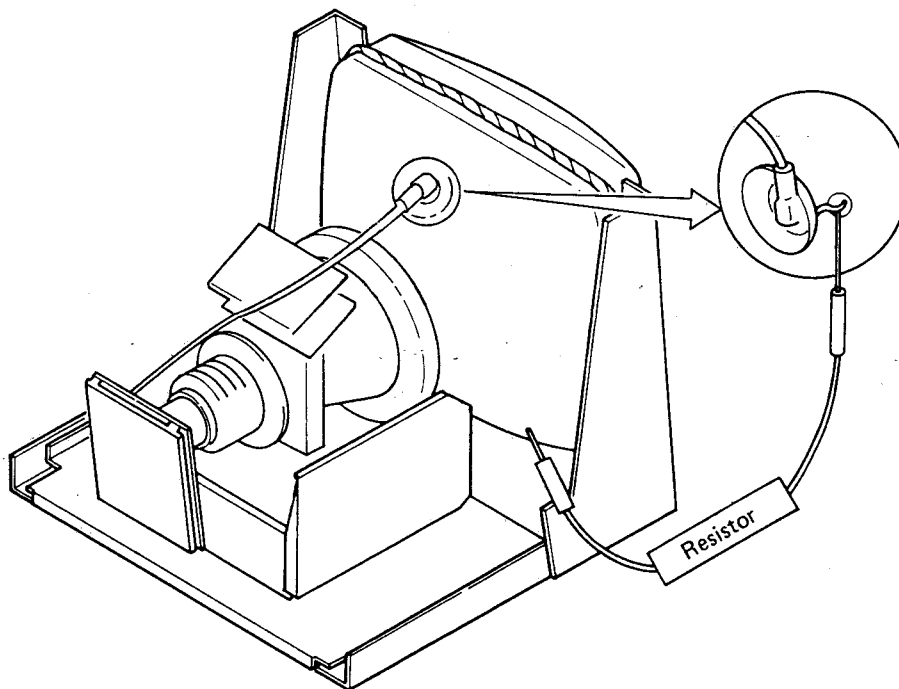
CRT Anode Discharge

1. When you check the CRT anode or replace CRT, discharge the CRT anode to the external conductive coating (aquadag) of CRT, especially when checked right after power turn-off.
2. Ground one end of a jumper wire which has a resistor (30kV < resisting pressure 100MΩ) and connect the other point to the CRT anode.

NOTE: Grounding must be done first.

This model has a section that does not share a common ground with the power supply section. The different sections are referred to as the HOT section and the COLD section in the precautions below.

1. Do not touch the HOT section and the COLD section at the same time. You may receive an electric shock.
2. Do not short the HOT section to the COLD section. This could blow the fuse or even damage parts.
3. Never measure the HOT section and the COLD section at the same time when using tools such as oscilloscopes or multimeters.
4. Always unplug the unit before beginning any operation such as removing the chassis.



ADJUSTMENT PROCEDURE

1. +B Voltage adjustment

Adjust the VR811 (AVR) so as that the voltage at TP85 (test point of main P.W.A) or TP87 (test point of CRT P.W.A) shall be 100V.

2. Purity adjustment

- If partial color phase irregularity is found on the screen, make the following adjustment.
 - (1) Degauss the magnetism of chassis and CRT with external degaussing coil.
 - (2) Adjust the purity magnet until each of the red, green and blue channels is free of color phase irregularity.
- If partial color phase irregularity cannot be corrected by the above when the CRT or deflection yoke has been replaced, make the following adjustment.
 - (1) Make sure that this adjustment is done later than 30 minutes after power on.
 - (2) Degauss the magnetism of chassis and CRT with degaussing coil.
 - (3) Confirm that static convergence is roughly matched.
 - (4) Remove the wedge stopper from the deflection yoke, and pull the deflection yoke fully to the front.
 - (5) Display green color solely with the signal generator.
 - (6) Adjust the purity magnet so that the center of the screen displays a pure green disk.
 - (7) After the adjustment of step 6, re-adjust the static convergence if some gap was found.
 - (8) After the item 7, repeat the step 6 again.
 - (9) Display red and blue disks. Adjust the purity magnets so as that each disk is at the center of the screen simultaneously.
 - (10) Slide the deflection yoke rearward until the screen appears green on the whole, and fasten it there. (Fasten in a forward position with ample allowance for landing).
 - (11) Confirm purity in each direction by rotating the set to direction of East, West, South and North after demagnetize by external degaussing coil.
 - (12) If magnetism remains even after the adjustment, use the compensation magnet to obtain purity.

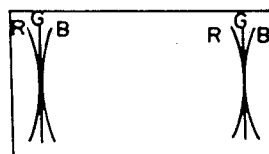
The final confirmation method for purity

In the natural magnetic field, rotate the monitor in the direction of East, West, South and North. Earth's magnetic field may cause magnetism on the monitor. Confirm that the automatic degaussing circuit built in the monitor erase the amount of magnetism which was introduced with above rotation.

The degaussing circuit operates only when the monitor is cold, you must wait for the monitor to cool after each purity test.

3. Convergence adjustment

- 1) Input the mixed cross-hatch pattern of R and B with the signal generator.
- 2) Match the R and B at screen center with four pole magnet. (Rotate the two ring magnets and R.B. move circularly with the other direction respectively.)
- 3) Input the mixed cross-hatch pattern of R.G.B. with the signal generator.
- 4) At the screen center, match R and B to G with the six-pole magnet.
- 5) Make the fine tuning of D.Y. location so as to get good convergence on the whole screen.
- 6) Adjust the convergence of the fringe area (four corners), using VR451B and VR452B.



If the convergence on the fringe area is bad, put "the magnetic small pieces" at the four corners of D.Y. and fix them so the convergence becomes better.

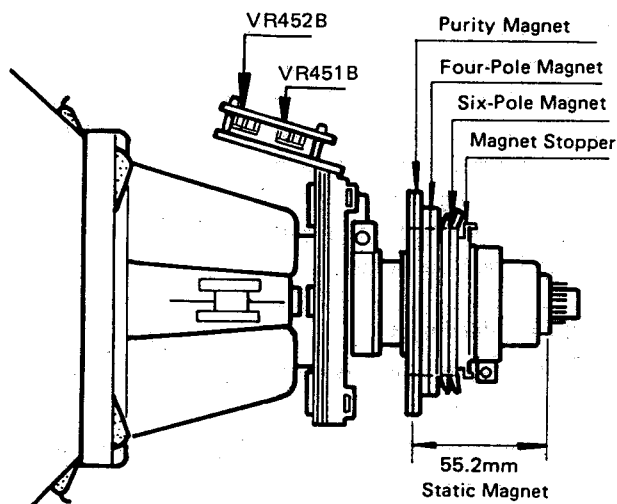
Note: Caution for putting "the magnetic small pieces".

- (1) Take more than 20mm distance from anode cap.
- (2) Don't put them together.
- (3) Don't put it on some other labels.

- 7) After the convergence adjustment, confirm if purity is OK.

In case purity is no good, back to [2] purity adjustment and re-adjust the purity.

- 8) Repeat the above procedure in several times to get the best purity and convergence.



4. H. Width adjustment

Adjust L542 (Width) so the width is 240mm.

5. Height adjustment

Adjust VR402 (Height) so the vertical size is 180mm.

6. Horizontal Hold (H. Hold) adjustment

- 1) Turn the horizontal hold control (VR511) and find the position in the low oscillator frequency direction at which the screen begins to move (f_{LOW}) and the position in the high oscillator frequency direction at which the screen begins to move (f_{HIGH}).
- 2) Set the adjustment to the point physically half-way between the f_{LOW} and f_{HIGH} positions found in step 1.

7. Vertical Hold (V. Hold) adjustment

Turn the vertical hold control (VR401) in the direction of lower oscillation frequencies (clockwise) until the screen begins to roll. Then, turn the adjustment back counter-clockwise until the vertical synchronization takes hold (the position is about 45 degrees clockwise from center).

8. Sub Horizontal Phase Control (Sub H.P.C.) adjustment

Center the image in the middle of the screen with the sub H.P.C. control (VR502).

9. V. Center adjustment

Adjust VR403 (V. Center) to locate the character area at the CRT center.

10. CRT cutoff, Sub Bright, White balance adjustment

- 1) Input the window pattern of R.G.B.I. with the signal generator.
- 2) Set the Sub Bright VR (VR1301), low light VR (VR631, VR632, VR633) and Drive VR (VR621, VR623) to the mechanical center.
- 3) Turn the brightness control (VR501) to MIN.
- 4) Turn the screen control until it comes to the point where the back raster and flyback line disappear.
- 5) Connect a digital voltmeter provided with a high impedance probe, between the test point of the CRT G2 (TP65) and ground (TP66) and measure G2 voltage. Then, turn the screen VR to the extent of $-10V$, thereby reducing G2 voltage. After this, remove the probe.
- 6) Turn the brightness control (VR501) to MAX.
- 7) Turn the SUB-BRIGHT control (VR1301) to adjust the luminance to 100 cd/m^2 (nit).
- 8) Turn the R-Drive control (VR621) and B-Drive control (VR623) until the chrominance is $X = 0.281$ and $Y = 0.311$, respectively.
- 9) Turning the brightness control (VR501), set the luminance to $5 \sim 10 \text{ cd/m}^2$ (nit).
- 10) Check the chrominance value and if it comes out of the specified chrominance range, turn the low light control R-LOW, G-LOW and B-LOW until it comes within the specification.
- 11) Cause the brightness control to be varied from maximum value to the minimum value and confirm the luminance and the color tracking. If anything is found unusual, repeat the steps 6) to 10).
- 12) Lock the screen control with lacquer coating.

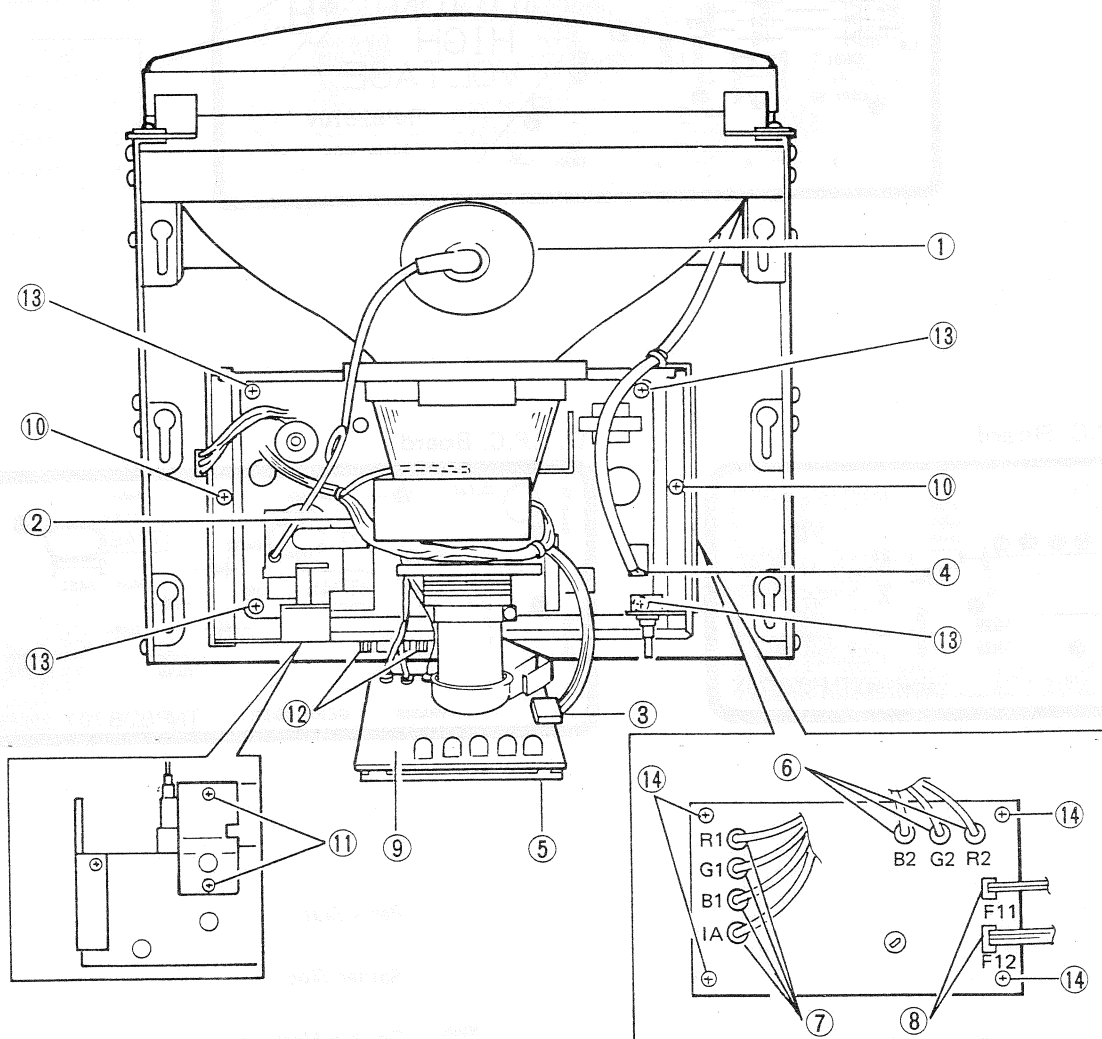
11. Focus adjustment

Turn the focus knob to make sure the focusing of the entire image is changed uniformly, and set the knob to a position where the focus balance of red, green, and blue colors is best.

DISASSEMBLY INSTRUCTIONS

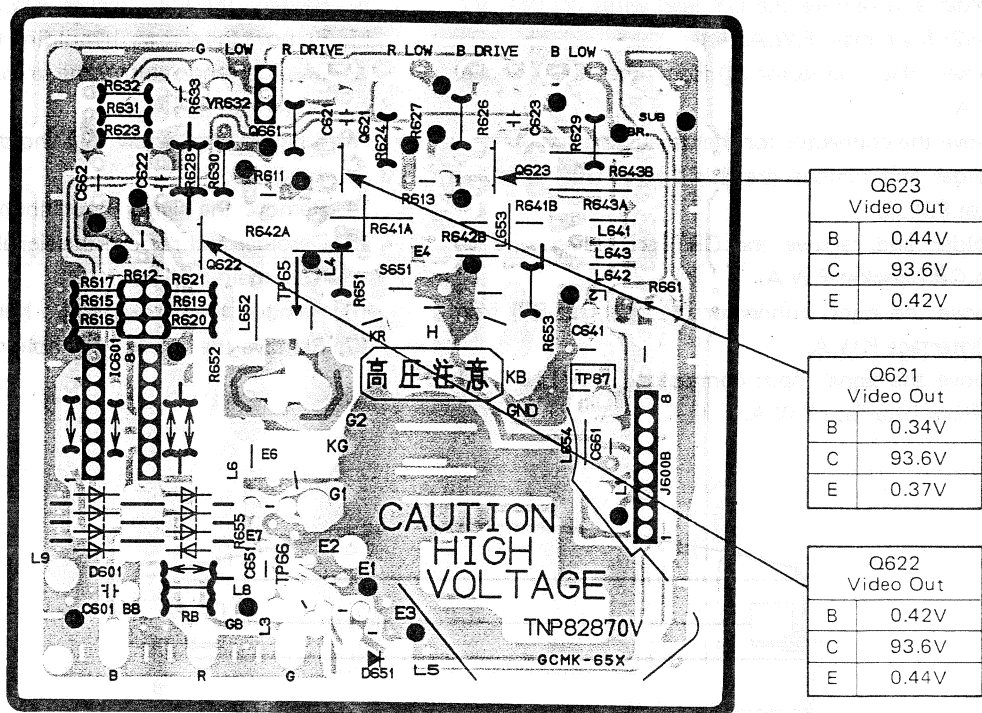
Chassis Block Removal (Main, CRT and Interface P.W.A.)

1. Remove the anode cap ① (Care must be taken as high voltage may be remaining.)
2. Desolder and remove the DY lead wires ② (V1, V2, H1, H2) from main P.W.A.
3. Remove the connector ③ from the CRT socket P.W.A.
4. Remove the connector for the degaussing coil ④
5. Desolder and remove the shield plate ⑤ from CRT socket P.W.A.
6. Desolder and remove the CRT grounding wire E1 from CRT socket P.W.A.
7. Remove the signal connector ⑥ (R2, G2, B2) from the Interface P.W.A.
8. Remove the signal input connector ⑦ (R1, G1, B1, 1A) from Interface P.W.A.
9. Remove the connector ⑧ (F11, F12) from the Interface P.W.A.
10. Remove the CRT socket P.W.A. ⑨ from the CRT.
11. Remove the screws ⑩ holding the chassis.
12. Desolder and remove the transistor lead wires Q541 from main P.W.A.
13. Remove the screw ⑪ holding the FBT holding bracket.
14. Remove the signal input connector ⑫ (3mm nut).
15. Desolder and remove the signal input connector leads from main P.W.A.
16. Remove the screws ⑬ holding the main P.W.A.
17. Remove the screws ⑭ holding the Interface P.W.A.

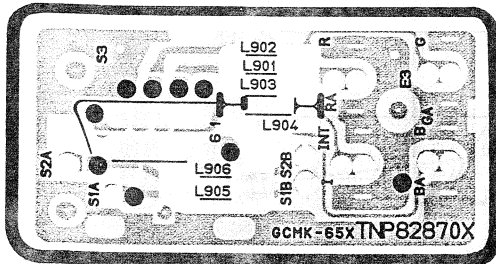


CIRCUIT BOARD SOLDER VIEW

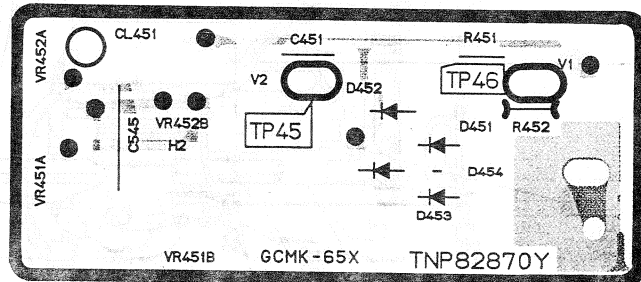
CRT P.C. Board



Signal P.C. Board



D.Y.P.C. Board



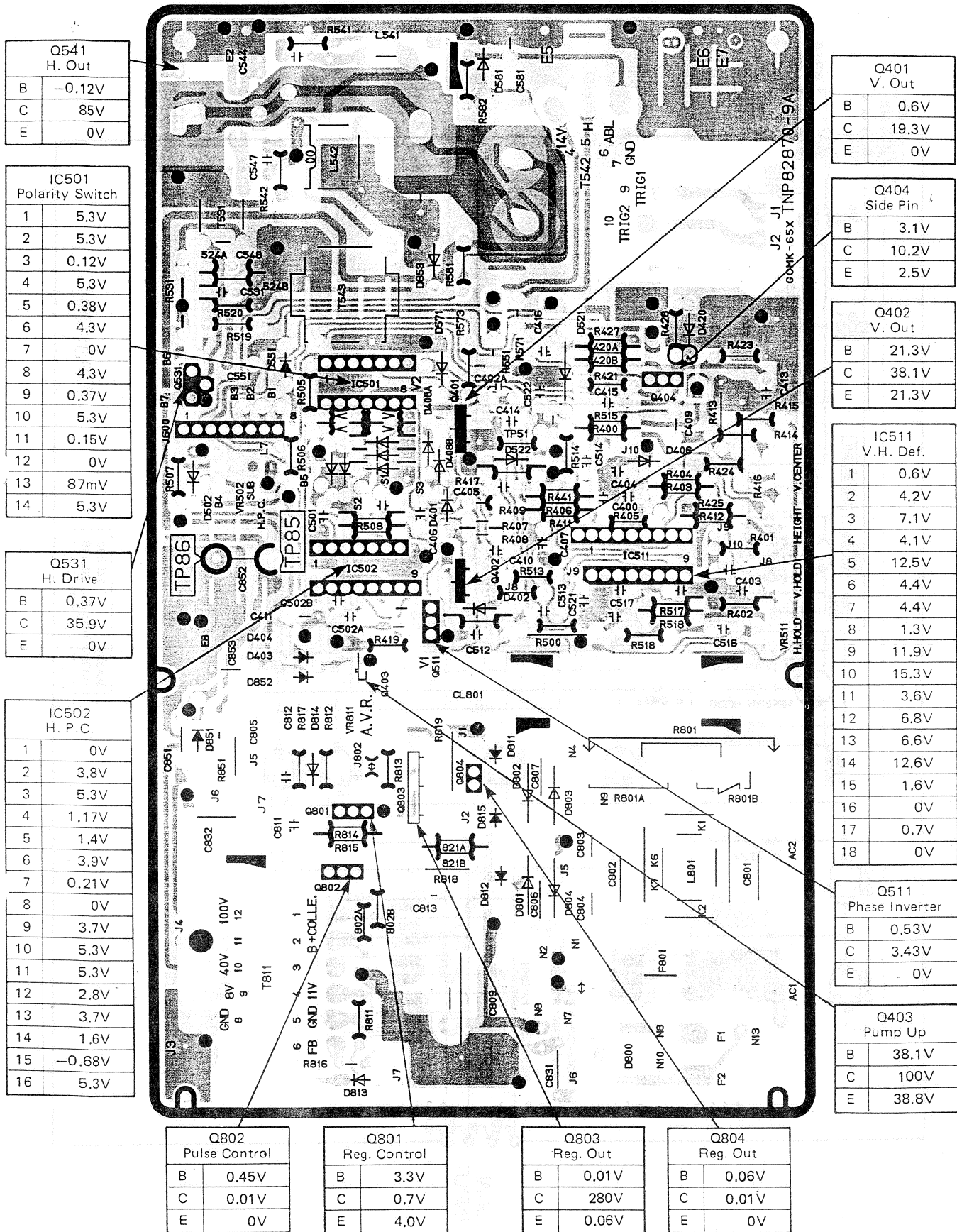
▨ : Parts Side

▨ : Solder Side

▨ : Double Masking

● : Connect point of solder side and parts side

CIRCUIT BOARD-SOLDER VIEW



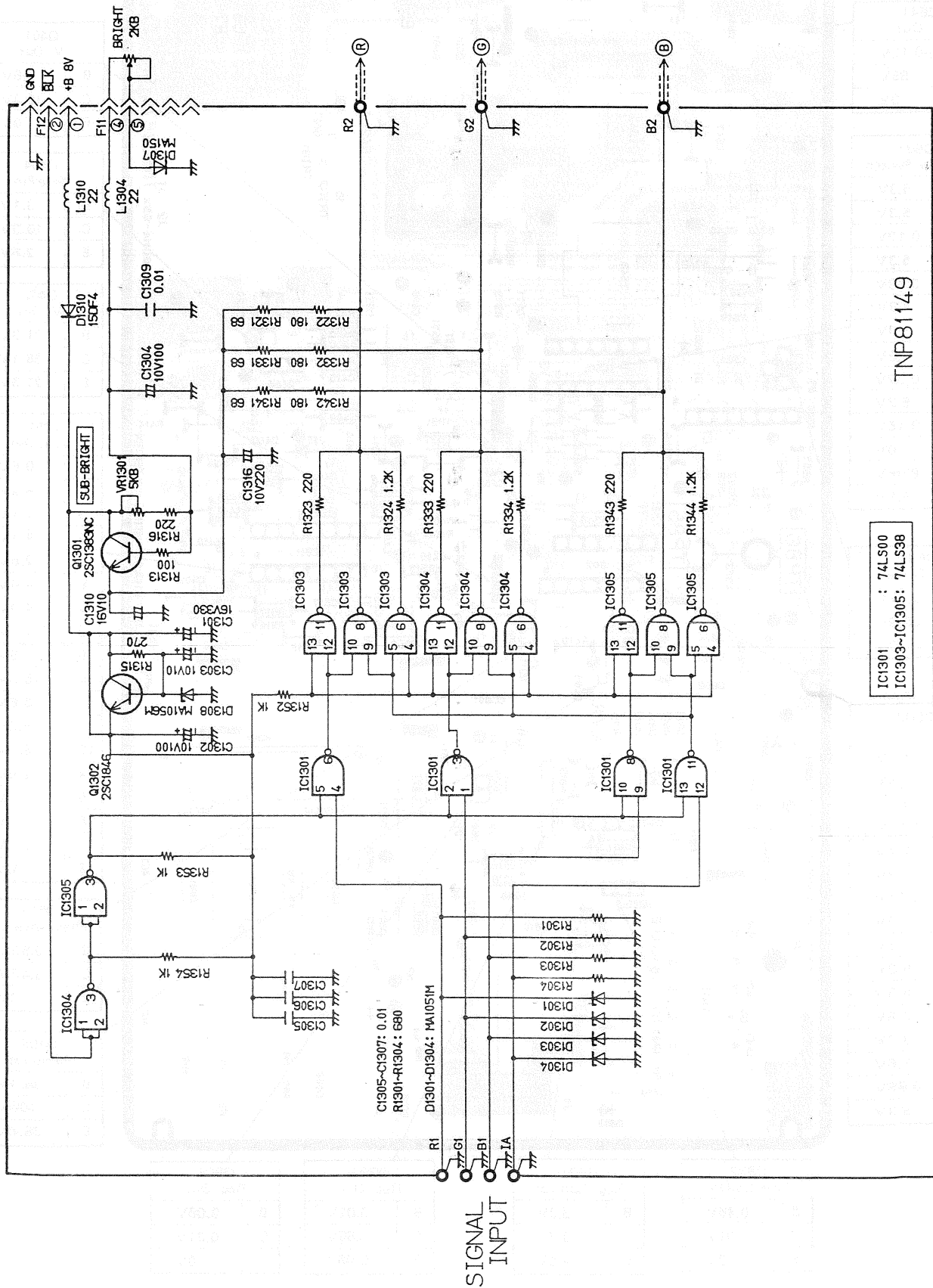
: Parts Side

: Solder Side

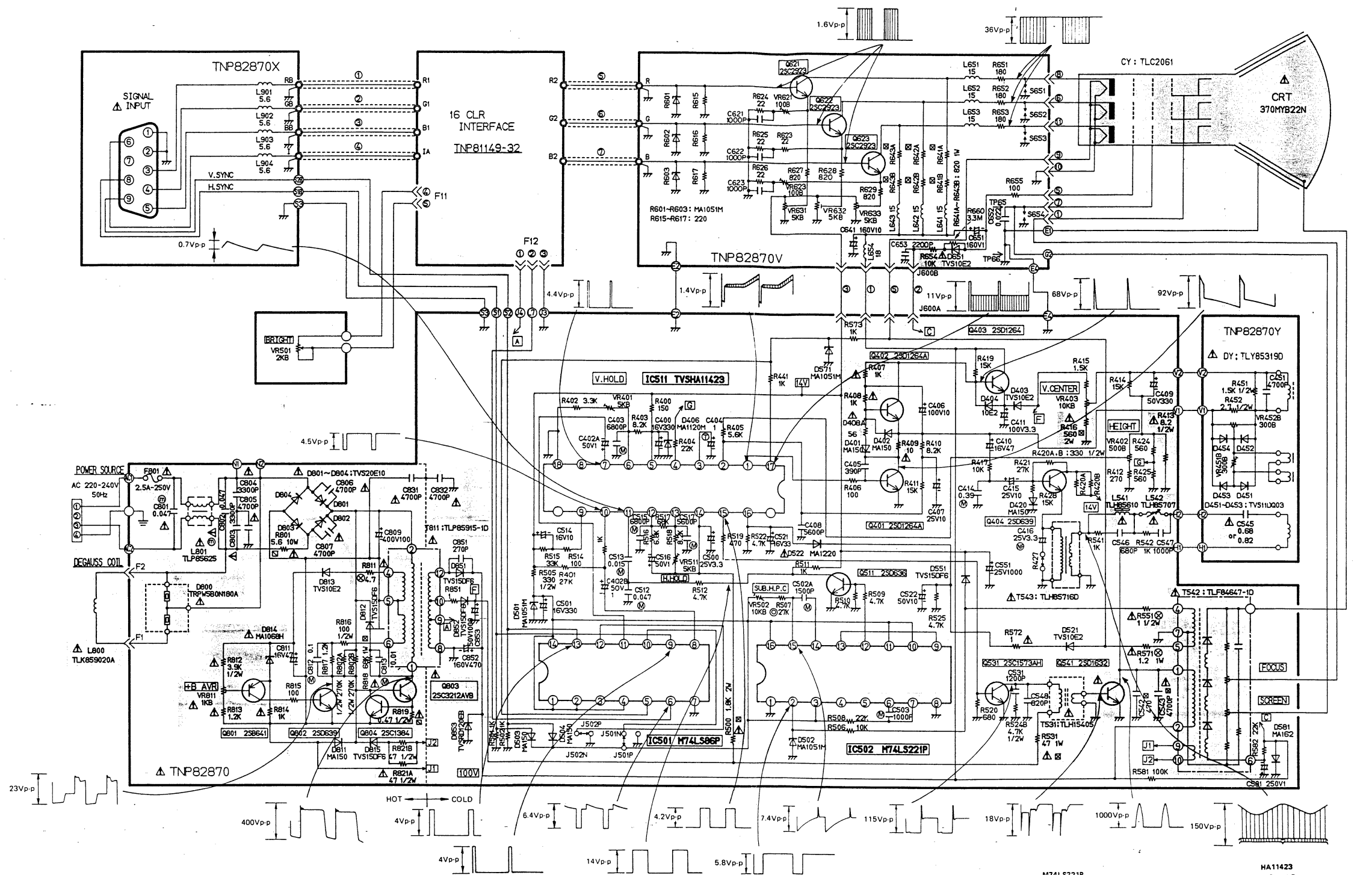
: Double Masking

• : Connect point of solder side and parts side

SCHEMATIC DIAGRAM FOR INTERFACE UNIT



SCHEMATIC DIAGRAM FOR MODEL TX-1413FHE



IMPORTANT SAFETY NOTICE
The components identified by shading or the international symbol on this schematic diagram incorporate special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing, it is essential that only manufacturer's specified parts be used for those critical components.

- NOTE**
- RESISTOR**
All resistors are 1/4W resistor.
Unit of Resistance is OHM (Ω). (K=1,000, M=1,000,000)
 - CAPACITOR**
Unit of capacitance is μF unless otherwise noted.
 - COIL**
Unit of inductance is μH.
 - VOLTAGE MEASUREMENT**
a. Voltage is measured by a digital meter with DC 10MΩ OHM/V receiving normal signal.
b. Use each measurement voltage for reference.

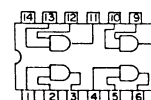
TRANSISTOR, DIODE & INTEGRATED CIRCUIT TERMINAL GUIDE	
	2SB641 2SD636 2SD639
	2SC1383 2SC1573AH
	2SD1264 2SD1264A
	2SC2923
	2SD1541 2SC3212A 2SD1632 2SC3210
	M74ALS08P M74LS86P
	M74LS221P
	HA11423
	silver 20E10 purple 10E2
	15DF6
	white MA150 black MA162
	red-brown MA1120M red-red MA1220M
	brown-brown-green MA1051M, RD120EB Gray-Gray-blue MA1068H
	LN217RP
	11DQ03

SERVICE NOTE

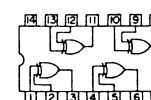
This model has a section that does not share a common ground with the power supply section. The different sections are referred to as the HOT section and the COLD section in the precautions below.

- Do not touch the HOT section and the COLD section at the same time. You may receive an electric shock.
- Do not short the HOT section to the COLD section. This could blow the fuse or even damage parts.
- Never measure the HOT section and the COLD section at the same time when using tools such as oscilloscopes or multimeters.
- Always unplug the unit before beginning any operation such as removing the chassis.

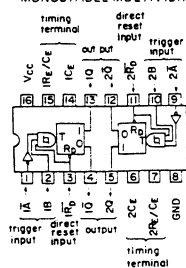
M74ALS08P
QUADRUPLE 2-INPUT
POSITIVE AND GATE



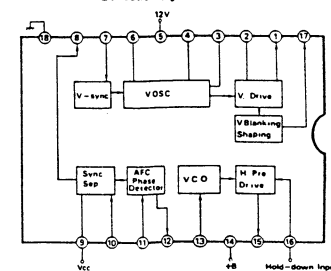
M74LS86P
QUADRUPLE 2-INPUT
EXCLUSIVE OR GATE



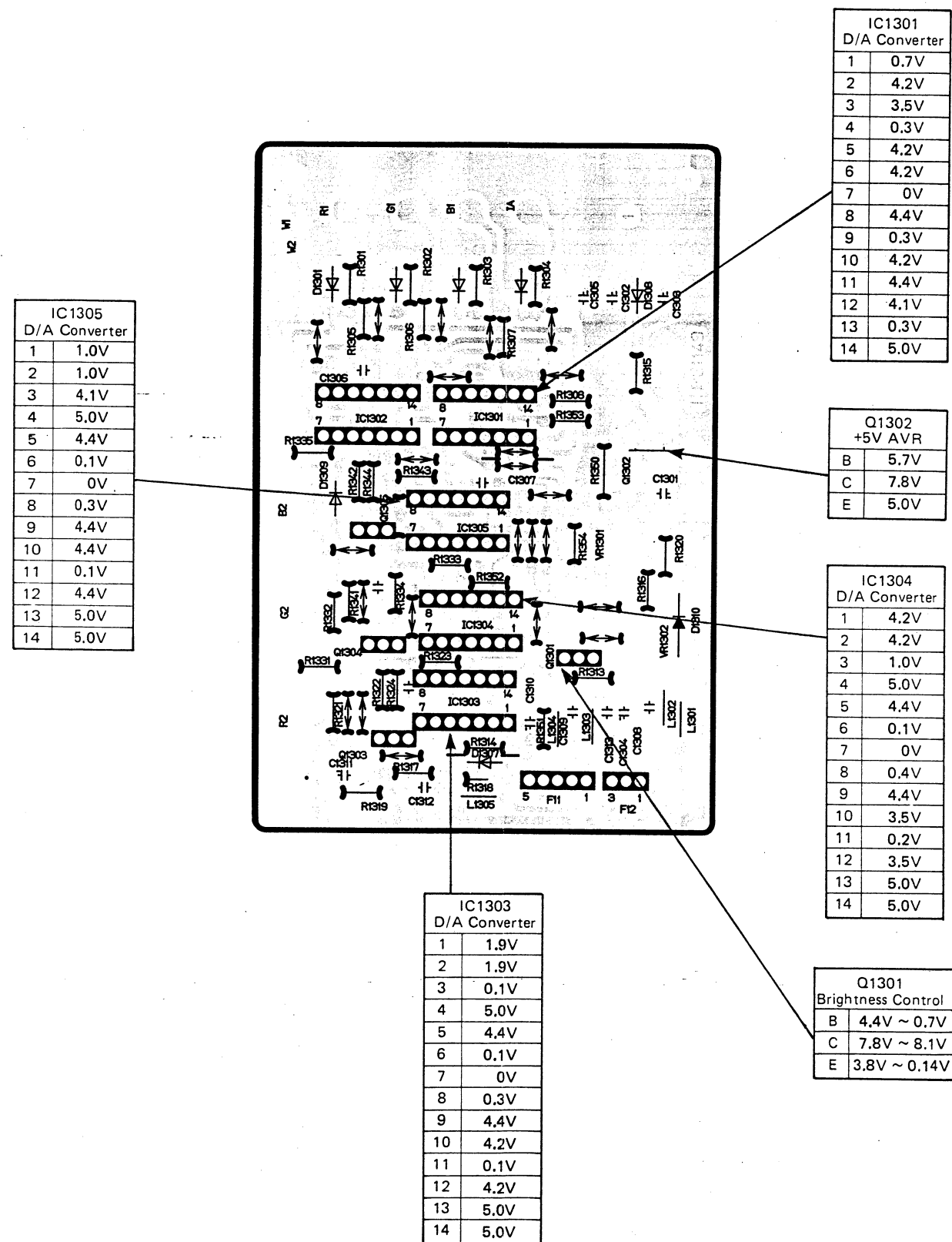
M74LS221P
MONOSTABLE MULTIVIBRATOR



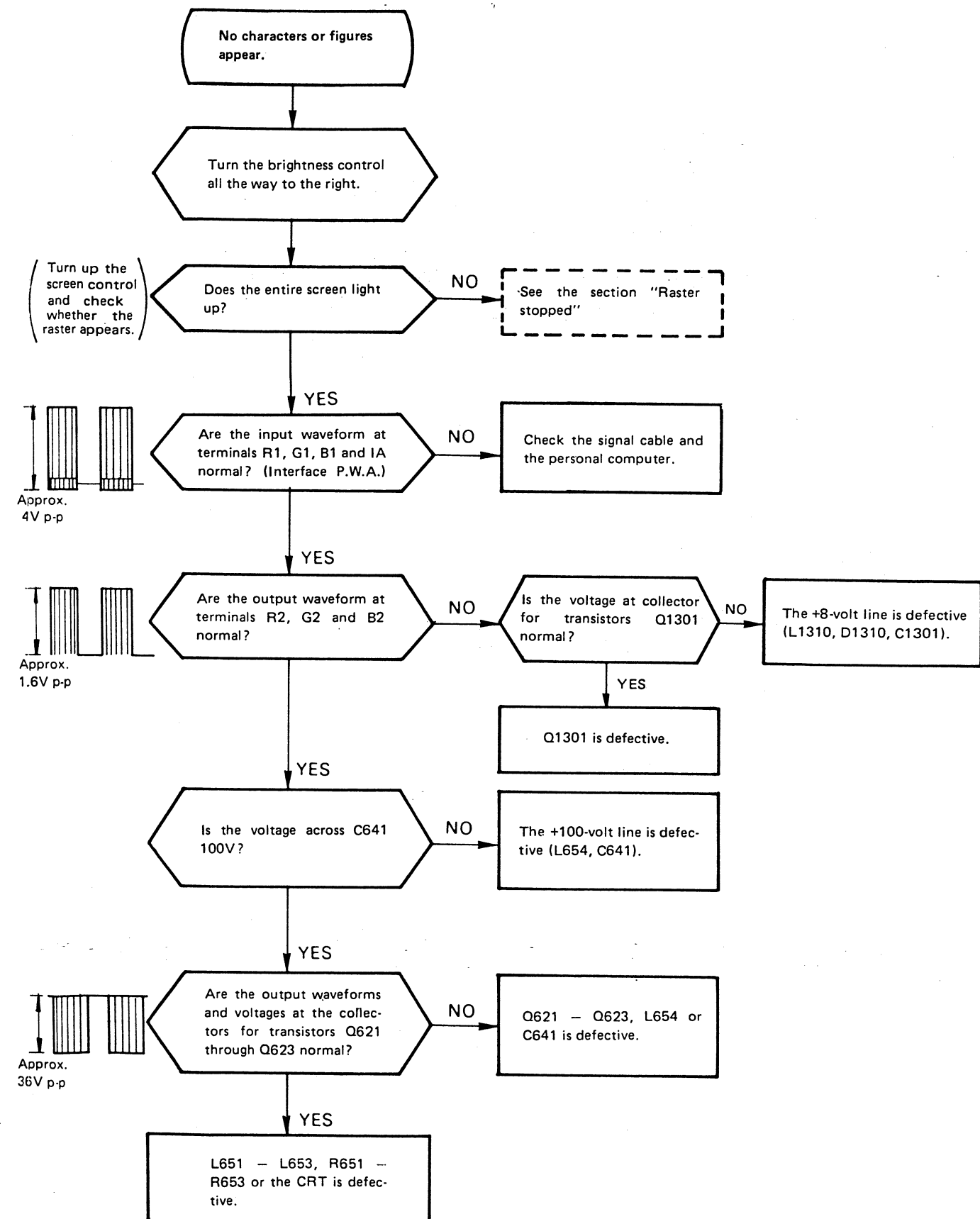
HA11423
Deflection Signal Processor

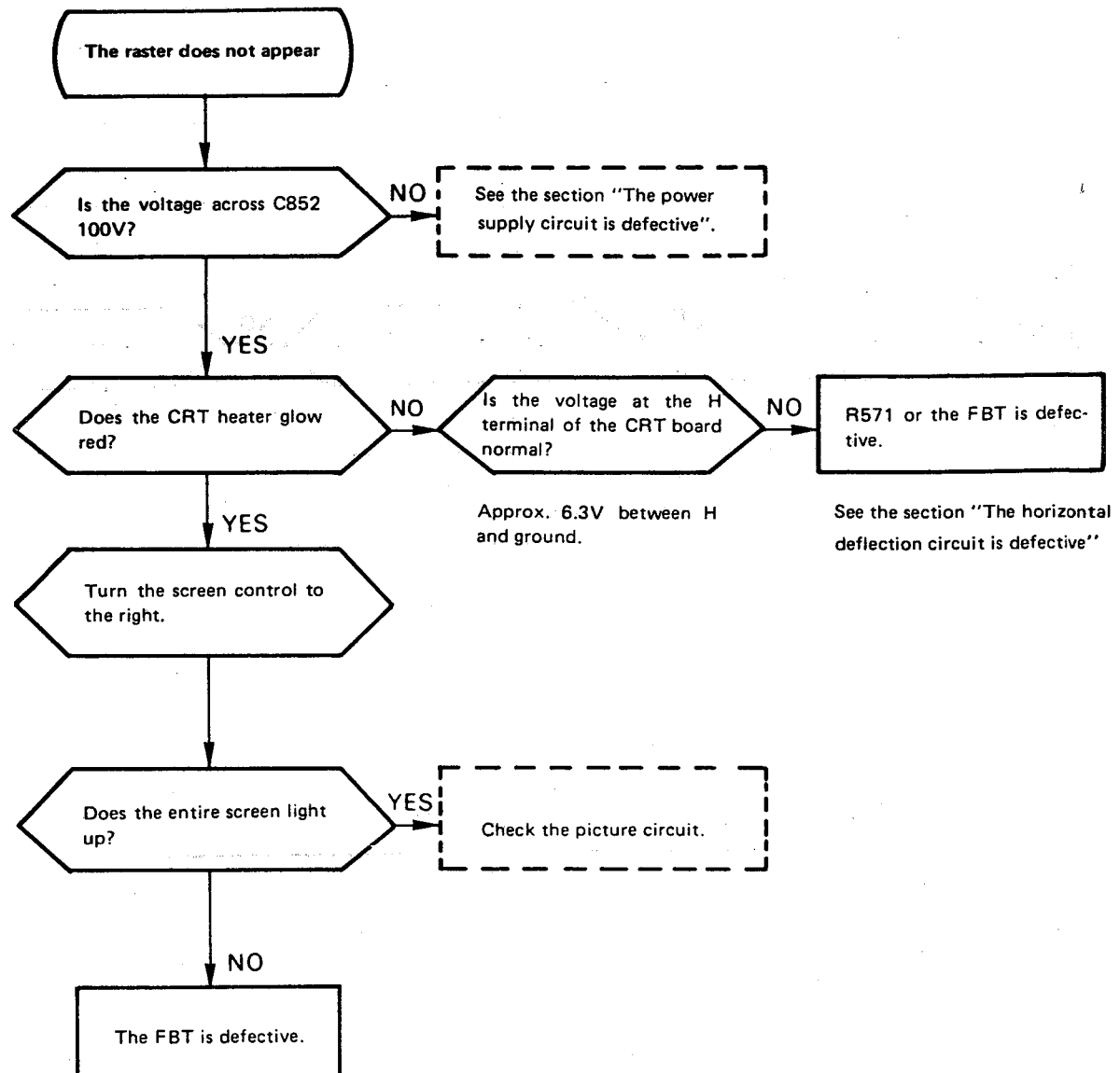


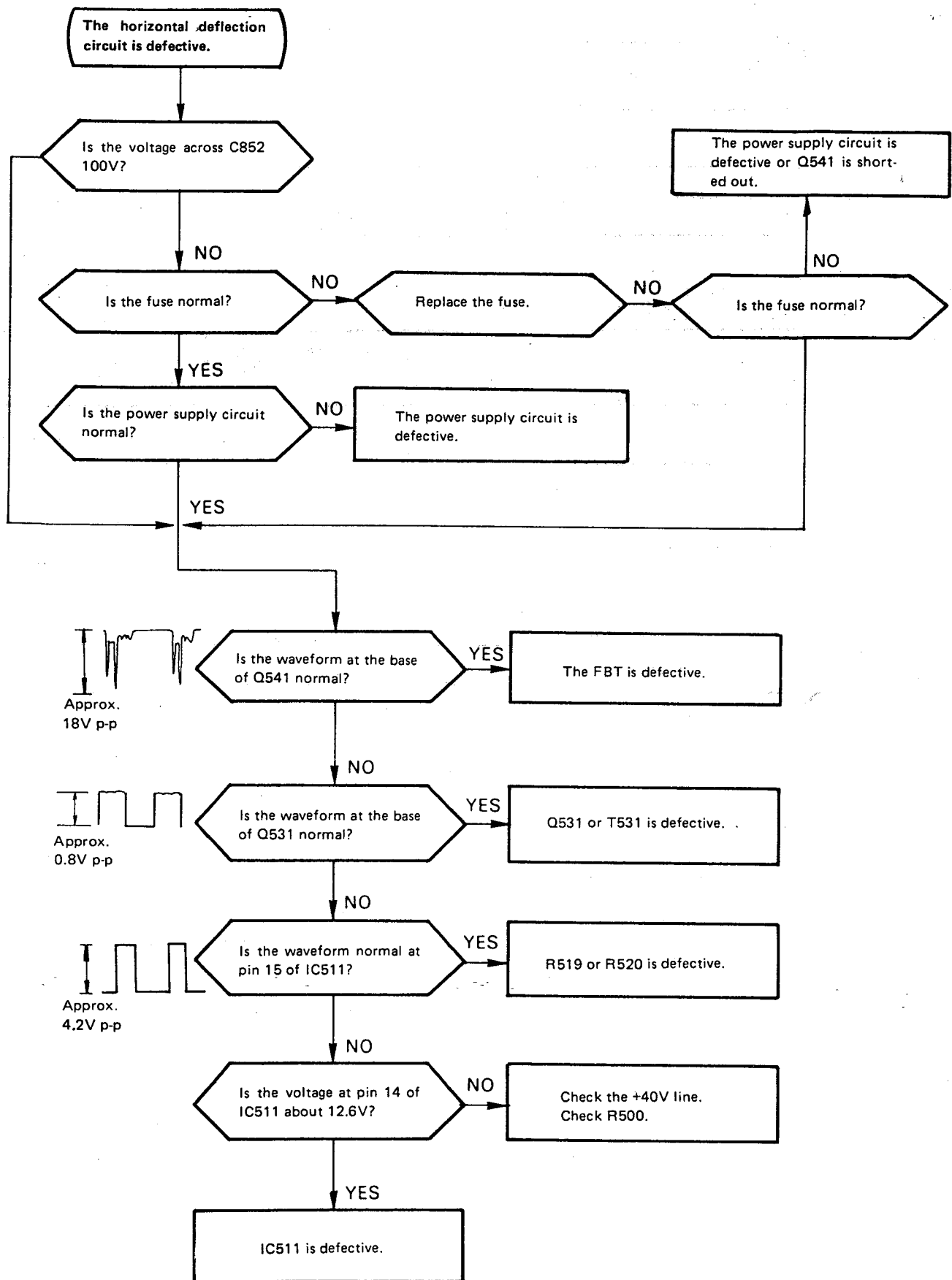
INTERFACE CIRCUIT BOARD-SOLDER VIEW

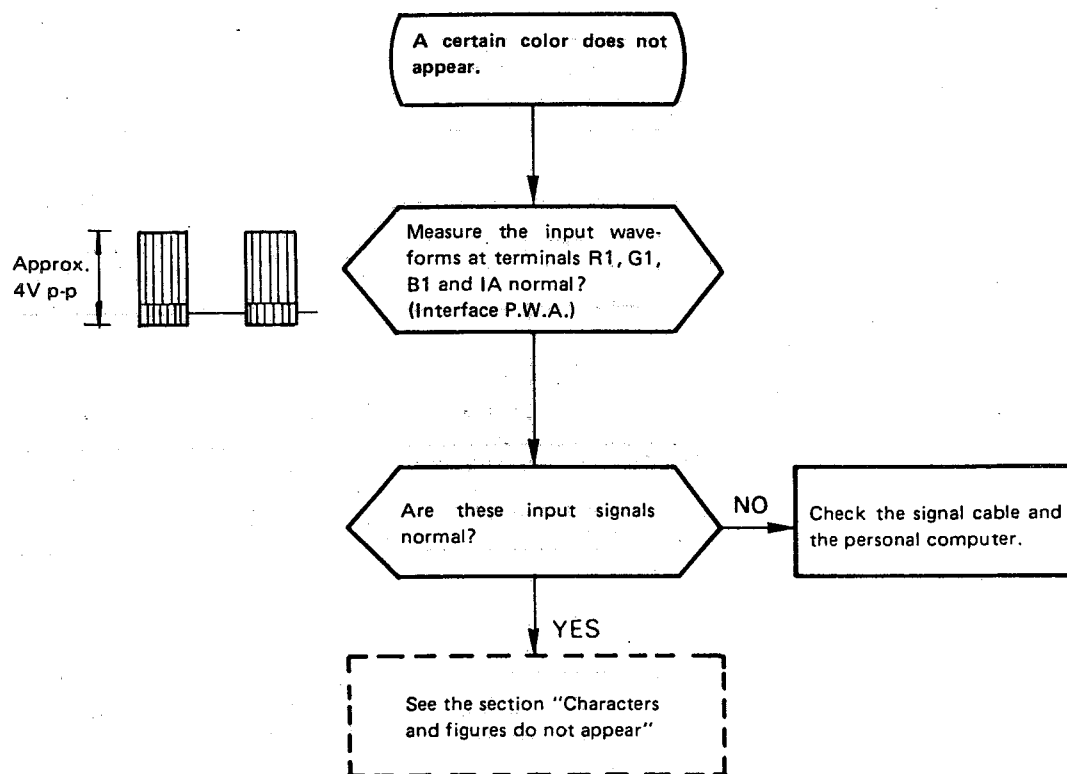


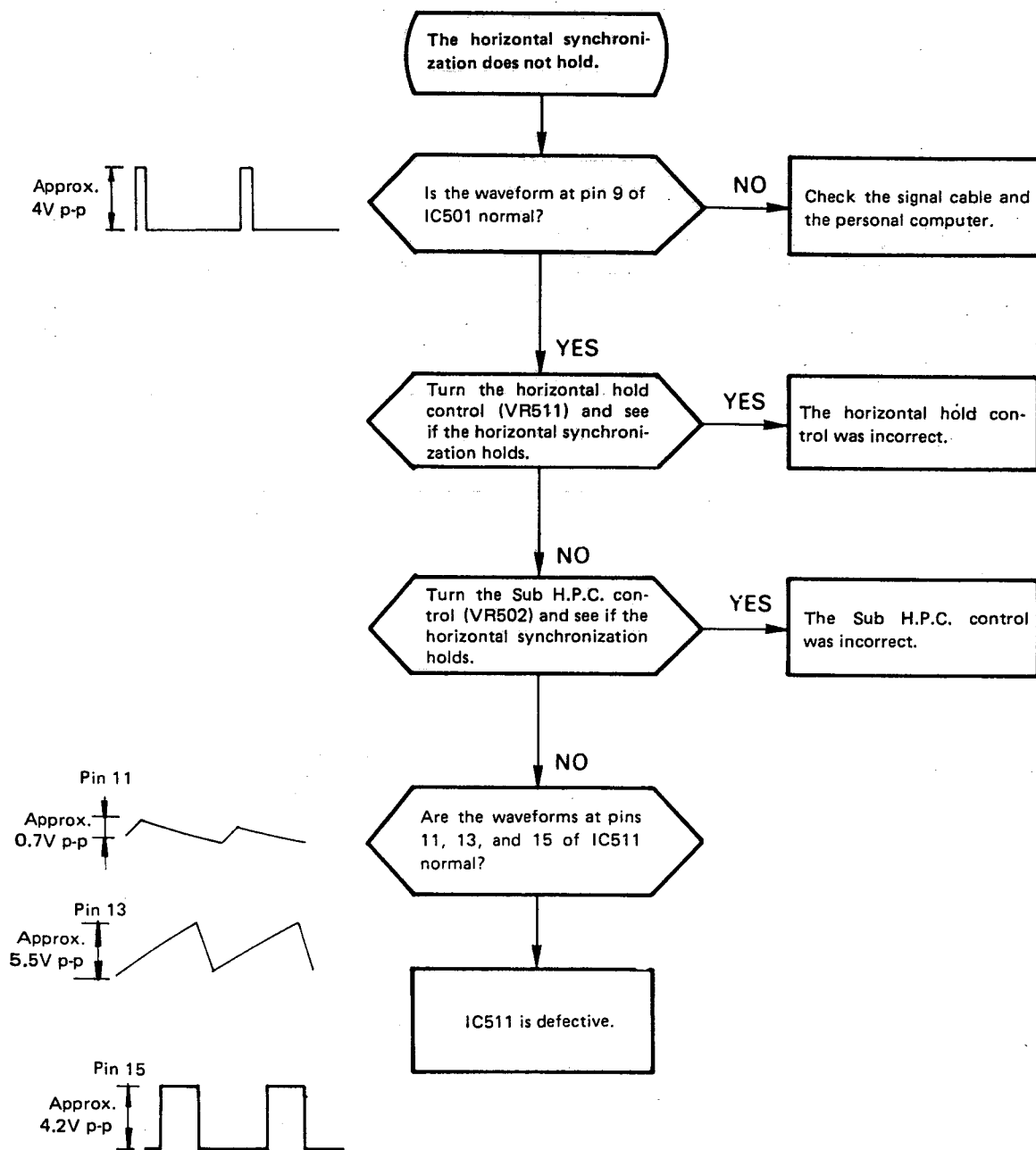
TROUBLE SHOOTING HINTS

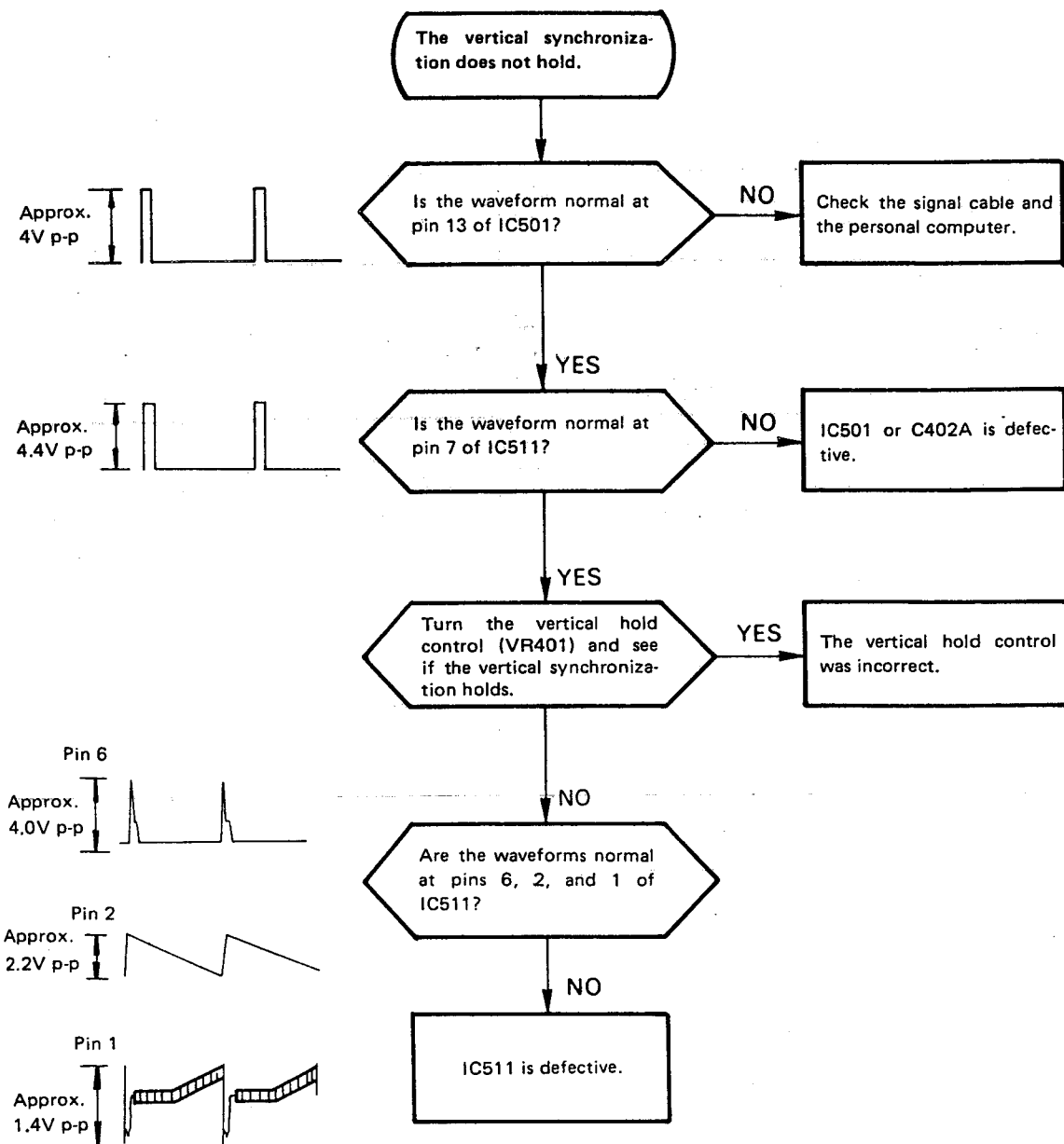


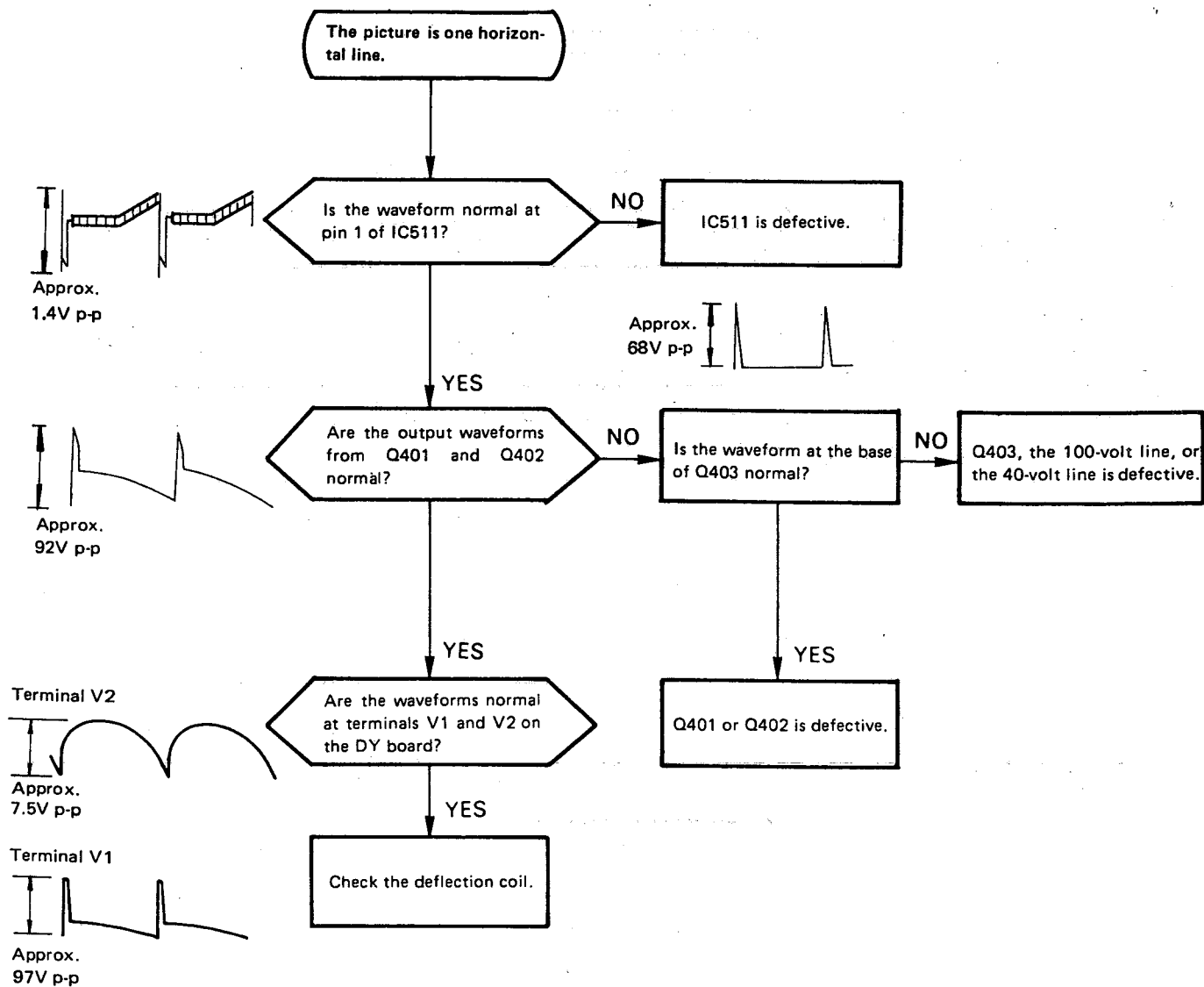


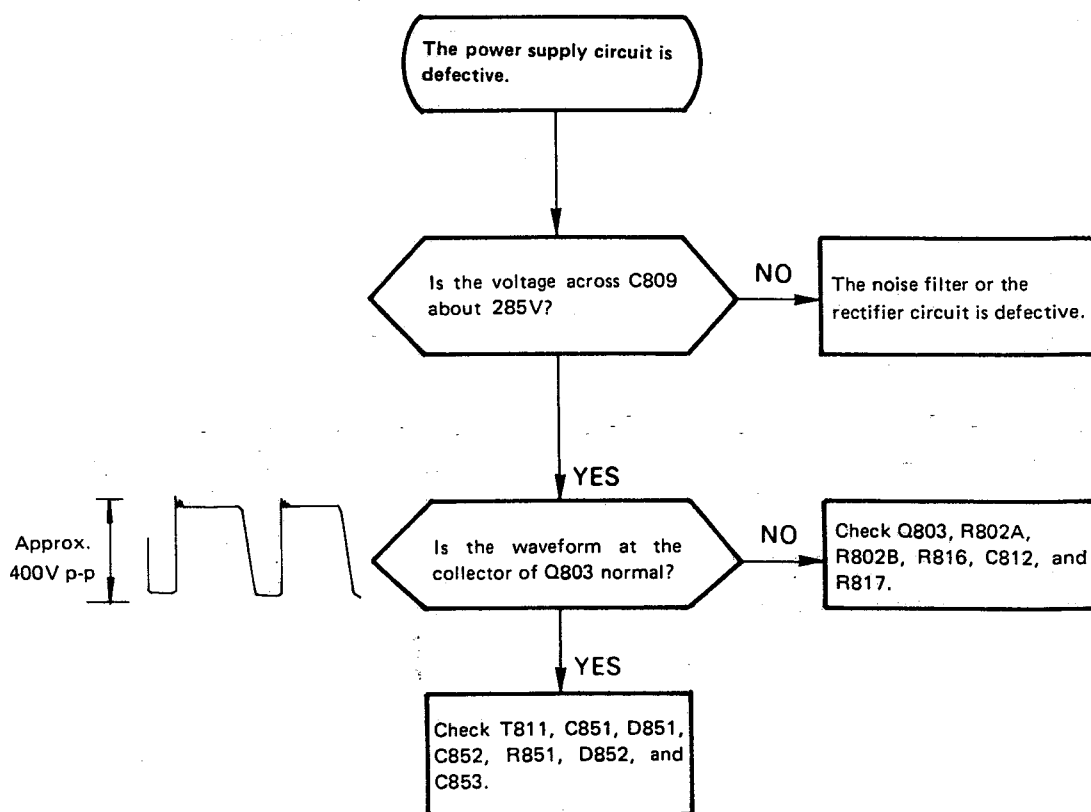
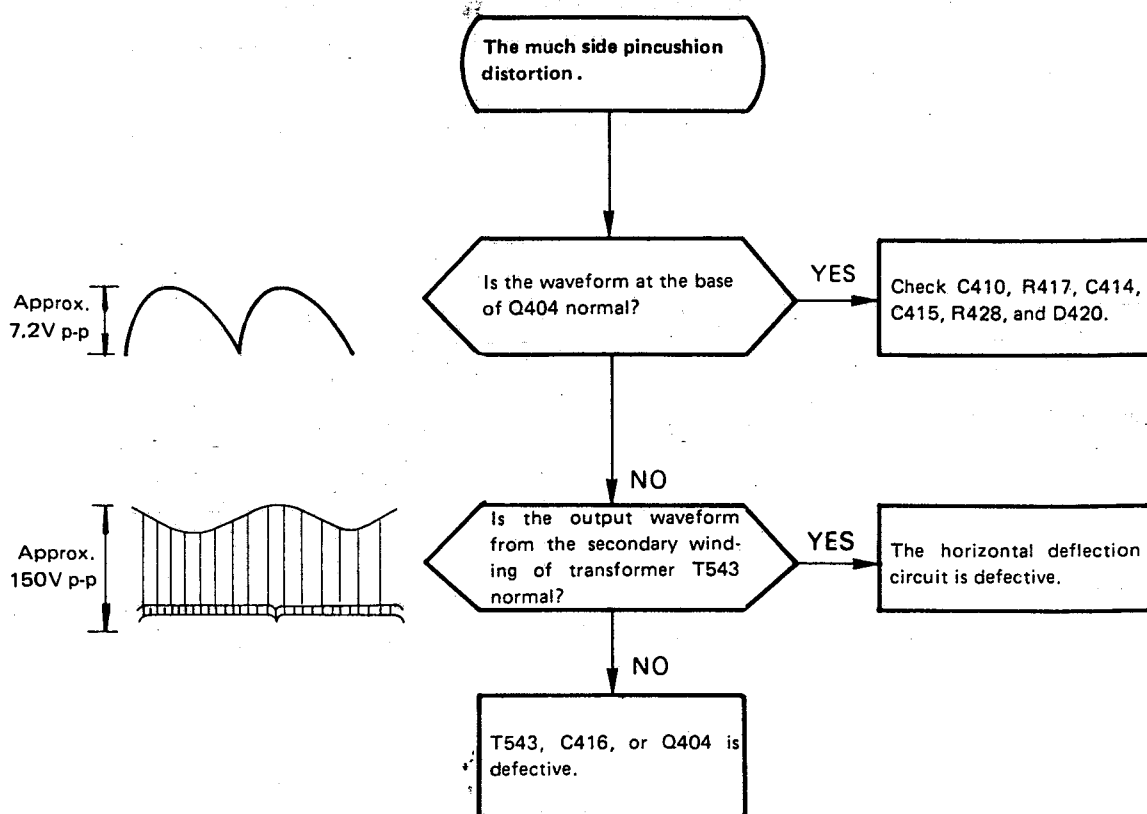












REPLACEMENT PARTS LIST

Important Safety Notice

Components identified by the International symbol Δ have special characteristics important for safety. When replacing any of these components use only manufacture's specified parts.

RESISTOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Carbon	F	$\pm 1\%$
F	Fuse	J	$\pm 5\%$
M	Metal Oxide	K	$\pm 10\%$
S	Solid	M	$\pm 20\%$
W	Wire Wound	G	$\pm 2\%$

Part No. Description
 Example: ERD25TJ104 \textcircled{C} 100K \textcircled{J} 1/4W

CAPACITOR

PART NAME & DESCRIPTION			
TYPE		ALLOWANCE	
C	Ceramic	C	$\pm 0.25\mu\text{F}$
E	Electrolytic	D	$\pm 0.5\mu\text{F}$
P	Polyester	F	$\pm 1\mu\text{F}$
S	Styrol	J	$\pm 5\%$
T	Tantalum	K	$\pm 10\%$
PP	Polypropylene	L	$\pm 15\%$
		M	$\pm 20\%$
		P	+100% -0%
		Z	+80% -20%

Part No. Description
 Example: ECKF1H103ZF \textcircled{C} 0.01 μF \textcircled{Z} 50V

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
	CABINET & MAIN PARTS			XWA4B	WASHER
Δ	TKX822001	PC BOARD HOLDER(BIG)		XWA5B	WASHER
	TUW85903	SIDE PLATE(R)		XWC3BFN	WASHER
	TUW85904	SIDE PLATE(L)		XWG3F10	WASHER
	TUX80701-2	CORD BRACKET (BIG)		XWG5H17	WASHER
	TUX80971	CORD BRACKET		XWS8A	WASHER
	TUX85106	UPPER PLATE	Δ	XYA4+EF8	SCREW
	TUX85121	BRACKET (CRT)	Δ	370MYB22NS	PICTURE TUBE
	TUX85122	PCB BRACKET	Δ	TNP81149-32	PC BOARD W/COMPONENT(IF)
	TUX85427-3	CHASSIS BRACKET(A)	Δ	TNP82870-35	PC BOARD W/COMPONENT(M)
	TUX85428	CHASSIS BRACKET(C)		TLY85319D	DEFLECTION YOKE
	TUX85452	IF BRACKET		TLC2061	CONVERGENCE COIL
	TUX85819-3	SIDE BRACKET(R)		TLK859020A	DEGAUSS COIL
	TUX85820-3	SIDE BRACKET(L)		TJS828790	9P SOCKET
	TUX85884-1	BOTTOM PLATE		TJT8907B	SOCKET
	TUC85210-1	SHIELD PLATE		TXAJTA4P424	4P CONNECTOR ASSY
Δ	TBM85260	MODEL PLATE	Δ	TXAJTC8P027	8P CONNECTOR ASSY
	TES201	SPRING(COIL)		TXAJTE2P163	2P CONNECTOR ASSY
	TMM1455	BEADS BAND	Δ	2SD1632RL	TRANSISTOR
	TMM81416	CORD BAND (SMALL)	VR501	EVH5WAF25B23	CONTROL B 2K OHM
	TMM81417	CORD BAND (BIG)		T4F72425Q	COTTON TAPE 55M
Δ	TMM81454	CORD BAND		T4F80918-1	TAPE
Δ	TMM85210	CRT SOCKET COVER		T4F90219-1	MAIRA TAPE 20M
Δ	TMM85411	BARRIER (EDGE)		TPC852841	OUTER CARTON
	TMM85511	RUBBER (WEDGE)		TPD359005	FILLER(PAD)
	TMK84549	PARMALLOY (BIG)		TXAPD21404XE	FILLER
	TMK84557	PARMALLOY (SMALL)		TPE814055	SET COVER
	XNS8	NUT		TQF14875	HIGH VOLTAGE LABEL
	XTB4+12A	SCREW		TQF80759	WARNING LABEL
	XTB4+16F	SCREW		TQF81259	SERIAL NO LABEL
	XTB4+35B	SCREW		TQF83647	FUSE LABEL
	XTV3+10A	SCREW	I.C		
	XTV3+12C	SCREW	IC501	M74LS86P	INTEGRATED CIRCUIT
	XTV3+8F	SCREW	IC502	M74LS221P	INTEGRATED CIRCUIT
	XTW3+6L	SCREW	IC511	TVSHA11423	INTEGRATED CIRCUIT
			IC1301	M74LSOOP	INTEGRATED CIRCUIT

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
IC1303	M74LS38P	INTEGRATED CIRCUIT	D1310	TVS15DF4	DIODE
IC1304	M74LS38P	INTEGRATED CIRCUIT		COIL & TRANSFORMERS	
IC1305	M74LS38P	INTEGRATED CIRCUIT			
	TRANSISTORS				
Q401	2SD1264AQLB	TRANSISTOR	△ L541	TLH85610	COIL
Q402	2SD1264AQLB	TRANSISTOR	△ L542	TLH85707	COIL
Q403	2SD1264PLB	TRANSISTOR	L641	TLU220J186	PEAKING COIL
Q404	2SD639R	TRANSISTOR	L642	TLU220J186	PEAKING COIL
Q511	2SD636R	TRANSISTOR	L643	TLU220J186	PEAKING COIL
Q531	2SC1573AH	TRANSISTOR	L651	TLU150K186	PEAKING COIL
Q621	2SC2923	TRANSISTOR	L652	TLU150K186	PEAKING COIL
Q622	2SC2923	TRANSISTOR	L653	TLU150K186	PEAKING COIL
Q623	2SC2923	TRANSISTOR	L654	TLU180J186	PEAKING COIL
Q801	2SB641R	TRANSISTOR	△ L801	TLP85625	TRANS
Q802	2SD639R	TRANSISTOR	L1301	TLU220J186	PEAKING COIL
△ Q803	2SC3212A	TRANSISTOR	L1304	TLU220J186	PEAKING COIL
Q804	2SC1384Q	TRANSISTOR	△ T531	TLH15405	COIL
Q1301	2SC1383QNC	TRANSISTOR	△ T542	TLF84647-1D	FLYBACK TRANS
Q1302	2SC1846Q	TRANSISTOR	△ T543	TLH85716D	COIL
	DIODES		△ T811	TLP85915-1D	TRANS
D401	MA150	DIODE		CONTROL	
D402	MA150	DIODE	VR401	EVZX2H3B53	CONTROL B 5K OHM
D403	TVS10E2	DIODE	VR402	EVZX2H3B52	CONTROL B 500 OHM
D404	TVS10E2	DIODE	VR403	EVTK0CA00B14	CONTROL B 10K OHM
D406	MA1120M	DIODE	VR451B	EVNK4BA00B32	CONTROL B 300 OHM
△ D408A	ERD25FJ560K	C 56 OHM J 1/4W	VR452B	EVNK4BA00B32	CONTROL B 300 OHM
D420	MA150	DIODE	VR502	EVMK4GA00B24	CONTROL B 20K OHM
D451	TVS11DQ03C	DIODE	VR511	EVZX2H3B53	CONTROL B 5K OHM
D452	TVS11DQ03C	DIODE	VR621	EVNK0BA00B12	CONTROL B 100 OHM
D453	TVS11DQ03C	DIODE	VR623	EVNK0BA00B12	CONTROL B 100 OHM
D454	TVS11DQ03C	DIODE	VR631	EVNK0BA00B53	CONTROL B 5K OHM
D501	MA1051M	DIODE	VR632	EVNK0BA00B53	CONTROL B 5K OHM
D502	MA1051M	DIODE	VR633	EVNK0BA00B53	CONTROL B 5K OHM
D503	MA150	DIODE	△ VR811	EVNK4BA00B13	CONTROL B 1K OHM
D504	MA150	DIODE	VR1301	EVN4HCA00B53	CONTROL B 5K OHM
D521	TVS10E2	DIODE		CAPACITORS	
△ D522	MA1220M	DIODE	C400	ECEA1CU331	E 330UF 16V
D551	TVS15DF6	DIODE	C402A	ECEA1HG010S	E 1UF 50V
D571	MA1051M	DIODE	C402B	ECEA1HU010	E 1UF 50V
D581	MA162	DIODE	C403	ECQB1H682JZ	P 6800PF J 50V
D651	TVS10E2	DIODE	C404	ECSF1VE105JN	T 1.0UF 35V
△ D800	TRPW5BON180A	THERMISTOR	C405	ECCF1H391J	C 390PF J 50V
△ D801	TVS20E10	DIODE	C406	ECEA1HG100	E 10UF 50V
△ D802	TVS20E10	DIODE	C407	ECEA1EU100	E 10UF 25V
△ D803	TVS20E10	DIODE	C408	ECKF1H562KB	C 5600PF K 50V
△ D804	TVS20E10	DIODE	C409	ECEA1HU331	E 330UF 50V
D811	MA150	DIODE	C410	ECEA1CU470	E 47UF 16V
D812	TVS15DF6	DIODE	C411	ECEA2AU010	E 1UF 100V
D813	TVS10E2	DIODE	C414	ECQV1H394JZ	P 0.39UF J 50V
△ D814	MA1068H	DIODE	C415	ECEA1EU100	E 10UF 25V
D815	TVS15DF6	DIODE	C416	ECEA1EN3R3S	E 3.3UF 25V
D851	TVS15DF6	DIODE	C451	ECKD2H472KB2	C 4700PF K 500V
D852	TVS15DF6	DIODE	C500	ECEA25Z3R3	E 3.3UF 25V
D853	TVSRD120EB	DIODE	C501	ECEA1CU331	E 330UF 16V
D1301	MA1051M	DIODE	C502A	ECQK1152JZ	P 1500PF J 100V
D1302	MA1051M	DIODE	C503	ECQK1102JZ	P 1000PF J 100V
D1303	MA1051M	DIODE	C512	ECQM1H473JZ	P 0.047UF J 50V
D1304	MA1051M	DIODE	C513	ECQM1H153JZ	P 0.015UF J 50V
D1307	MA150	DIODE	C514	ECEA1CU100	E 10UF 16V
D1308	MA1056M	DIODE	C515	ECQK1682JZ	P 6800PF J 100V

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
C516	ECEA1HU010	E 1UF 50V	R414	ERD25FJ153K	C 15K OHM J 1/4W
C517	ECQK1562JZ	P 5600PF J 100V	R415	ERD25FJ152K	C 1.5K OHM J 1/4W
C521	ECEA1CU330	E 33UF 16V	R416	ERG25J561	M 560 OHM J 2W
C522	ECEA1HU100	E 10UF 50V	R417	ERD25FJ103K	C 10K OHM J 1/4W
C531	ECKD2H122KB2	C 1200PF K 500V	R419	ERD25FJ153K	C 15K OHM J 1/4W
C542	ECKC3D471KBN	C 470PF K 2KV	R420A	ERDS1FJ331	C 330 OHM J 1/2W
△ C543	ECWH12H472JS	PP 4700PF J 1.2KV	R420B	ERDS1FJ331	C 330 OHM J 1/2W
△ C545	ECWF2H824JZ	PP 0.82UF J 500V	R421	ERD25FJ273K	C 27K OHM J 1/4W
C546	ECKD2H681KB2	C 680PF K 500V	R424	ERD25FJ561K	C 560 OHM J 1/4W
C547	ECKD2H102KB2	C 1000PF K 500V	R425	ERD25FJ471K	C 470 OHM J 1/4W
C548	ECKD2H471KB2	C 470PF K 500V	R427	ERD25TCO	C 0 OHM 1/4W
C551	ECEA1EFE102	E 1000UF 25V	R428	ERD25FJ153K	C 15K OHM J 1/4W
C581	ECEA2ES010	E 1UF 250V	R441	ERD25FJ102K	C 1K OHM J 1/4W
C621	ECKF1H102KB	C 1000PF K 50V	R451	ERDS1FJ152	C 1.5K OHM J 1/2W
C622	ECKF1H102KB	C 1000PF K 50V	R452	ERDS1FJ2R7	C 2.7 OHM J 1/2W
C623	ECKF1H102KB	C 1000PF K 50V	△ R500	ERG25J182	M 1.8K OHM J 2W
C641	ECEA2CG100S	E 10UF 160V	R501	ERD25FJ102K	C 1K OHM J 1/4W
C651	ECEA2CS010	E 1UF 160V	R502	ERD25FJ102K	C 1K OHM J 1/4W
C652	ECKC3D472KBN	C 4700PF K 2KV	R505	ERDS1FJ331	C 330 OHM J 1/2W
C653	ECKD2H222KB2	C 2200PF K 500V	R506	ERDS1FJ103	C 10K OHM J 1/2W
△ C801	ECQE2A104MW	P 0.1UF M 250V	R507	ER025CKF3302	M 33K OHM F 1/4W
△ C802	ECQE2A104MW	P 0.1UF M 250V	R508	ERD25FJ223K	C 22K OHM J 1/4W
△ C803	ECKCNS472MFJ	C 4700PF M	R509	ERD25FJ472K	C 4.7K OHM J 1/4W
△ C804	ECKCNS472MFJ	C 4700PF M	R510	ERD25FJ472K	C 4.7K OHM J 1/4W
△ C805	ECKCNS472MFJ	C 4700PF M	R511	ERD25FJ102K	C 1K OHM J 1/4W
△ C806	ECKCNS472MFJ	C 4700PF M	R512	ERD25FJ472K	C 4.7K OHM J 1/4W
△ C807	ECKCNS472MFJ	C 4700PF M	R514	ERD25FJ101K	C 100 OHM J 1/4W
C809	ECES2GV101	E 100UF 400V	R515	ERD25FJ333K	C 33K OHM J 1/4W
C811	ECEA16Z47	E 47UF 16V	R516	ERD25FJ682K	C 6.8K OHM J 1/4W
C812	ECQV1H104JZ	P 0.1UF J 50V	R517	ERD25FJ683K	C 68K OHM J 1/4W
C813	ECQM4103KZ	P 0.01UF K 400V	R518	ERD25FJ822K	C 8.2K OHM J 1/4W
△ C831	ECKCNS472MFJ	C 4700PF M	R519	ERD25FJ471K	C 470 OHM J 1/4W
△ C832	ECKCNS472MFJ	C 4700PF M	R520	ERD25FJ681K	C 680 OHM J 1/4W
C851	ECKC3D271JBN	C 270PF J 2KV	R522	ERD25FJ472K	C 4.7K OHM J 1/4W
C852	ECES2CH471	E 470UF 160V	R524B	ERDS1FJ472	C 4.7K OHM J 1/2W
C853	ECEA1HU102	E 1000UF 50V	R525	ERD25FJ472K	C 4.7K OHM J 1/4W
C1301	ECEA1CU331	E 330UF 16V	△ R531	ERG1SJ470	M 47 OHM J 1W
C1302	ECEA1AU101	E 100UF 10V	R541	ERD25FJ102K	C 1K OHM J 1/4W
C1303	ECEA1CU100	E 10UF 16V	R542	ERD25FJ102K	C 1K OHM J 1/4W
C1304	ECEA1CU101	E 100UF 16V	△ R551	ERQ12HJ1R0	F 1 OHM J 1/2W
C1305	ECKF1H103ZF	C 0.01UF Z 50V	△ R571	ERQ1CJ1R2	F 1.2 OHM J 1W
C1306	ECKF1H103ZF	C 0.01UF Z 50V	△ R572	ERD25FJ1R0K	C 1 OHM J 1/4W
C1307	ECKF1H103ZF	C 0.01UF Z 50V	R573	ERD25FJ102K	C 1K OHM J 1/4W
C1309	ECKF1H103ZF	C 0.01UF Z 50V	R581	ERD25FJ334K	C 330K OHM J 1/4W
C1310	ECEA1CU100	E 10UF 16V	R582	ERD25FJ223K	C 22K OHM J 1/4W
C1316	ECEA1AU221	E 220UF 10V	R601	MA1051M	DIODE
	RESISTORS		R602	MA1051M	DIODE
			R603	MA1051M	DIODE
R400	ERDS1FJ151	C 150 OHM J 1/2W	R615	ERD25FJ221K	C 220 OHM J 1/4W
R401	ERD25FJ273K	C 27K OHM J 1/4W	R616	ERD25FJ221K	C 220 OHM J 1/4W
R402	ERD25FJ332K	C 3.3K OHM J 1/4W	R617	ERD25FJ221K	C 220 OHM J 1/4W
R403	ERD25FJ822K	C 8.2K OHM J 1/4W	R623	ERD25FJ220K	C 22 OHM J 1/4W
R404	ERD25FJ223K	C 22K OHM J 1/4W	R624	ERD25FJ220K	C 22 OHM J 1/4W
R405	ERD25FJ562K	C 5.6K OHM J 1/4W	R625	ERD25FJ220K	C 22 OHM J 1/4W
R406	ERD25FJ101K	C 100 OHM J 1/4W	R626	ERD25FJ220K	C 22 OHM J 1/4W
△ R407	ERD25FJ102K	C 1K OHM J 1/4W	R627	ERD25FJ821K	C 820 OHM J 1/4W
△ R408	ERD25FJ102K	C 1K OHM J 1/4W	R628	ERD25FJ821K	C 820 OHM J 1/4W
△ R409	ERD25FJ100K	C 10 OHM J 1/4W	R629	ERD25FJ821K	C 820 OHM J 1/4W
R410	ERD25FJ822K	C 8.2K OHM J 1/4W	R641A	ERG1ANJ821	M 820 OHM J 1W
R411	ERD25FJ153K	C 15K OHM J 1/4W	R641B	ERG1ANJ821	M 820 OHM J 1W
R412	ERD25FJ271K	C 270 OHM J 1/4W	R642A	ERG1ANJ821	M 820 OHM J 1W
△ R413	ERD50FJ8R2	C 8.2 OHM J 1/2W	R642B	ERG1ANJ821	M 820 OHM J 1W

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
R643A	ERG1ANJ821	M 820 OHM J 1W		XTV3+6A	SCREW
R643B	ERG1ANJ821	M 820 OHM J 1W		XTV3+8C	SCREW
R651	ERD25FJ181K	C 180 OHM J 1/4W		XWG3F10	WASHER
R652	ERD25FJ181K	C 180 OHM J 1/4W	AC1	TJE80301	TERMINAL
R653	ERD25FJ181K	C 180 OHM J 1/4W	AC2	TJE80301	TERMINAL
△ R654	ERD25FJ103K	C 10K OHM J 1/4W	B1	TJS848100	SOCKET
R655	ERD25FJ101K	C 100 OHM J 1/4W	B2	TJS848100	SOCKET
R660	ERDS1FJ335	C 3.3M OHM J 1/2W	B-	TWH892040	CABLE
△ R801	ERF10ZYK5R6	W 5.6 OHM K 10W	BA-	TWH892038	CABLE
R802A	ERDS1FJ274	C 270K OHM J 1/2W	△ CRT	TJS828620	CRT SOCKET
R802B	ERDS1FJ274	C 270K OHM J 1/2W	F1	TEL302-9	TERMINAL
△ R811	ERQ14AJ4R7	F 4.7 OHM J 1/4W	F2	TEL302-9	TERMINAL
△ R812	ERDS1FJ392	C 3.9K OHM J 1/2W	F11	TJS878202	2P SOCKET
△ R813	ERD25FJ122K	C 1.2K OHM J 1/4W	F12	TJS878203	3P SOCKET
△ R814	ERD25FJ102K	C 1K OHM J 1/4W	△ F801	XBA2C25TROA	FUSE
R815	ERD25FJ101K	C 100 OHM J 1/4W	G1	TJS848100	SOCKET
R816	ERD50FJ101	C 100 OHM J 1/2W	G2	TJS848100	SOCKET
R817	ERD25FJ122K	C 1.2K OHM J 1/4W	G-	TWH892040	CABLE
△ R818	ERG1ANJ683	M 68K OHM J 1W	GA-	TWH892038	CABLE
△ R819	ERW12PKR47	W 0.47 OHM K 1/2W	I-	TWH892038	CABLE
△ R821A	ERDS1FJ470	C 47 OHM J 1/2W	IA	TJS848100	SOCKET
R821B	ERDS1FJ470	C 47 OHM J 1/2W	J600A	TJS868480	8P SOCKET
R851	ERD25FJ1ROK	C 1 OHM J 1/4W	J600B	TJS868580	8P SOCKET
R1301	ERD25FJ681K	C 680 OHM J 1/4W	JS802	TJC3316	FUSE HOLDER
R1302	ERD25FJ681K	C 680 OHM J 1/4W	JS803	TJC3316	FUSE HOLDER
R1303	ERD25FJ681K	C 680 OHM J 1/4W	R-	TWH892040	CABLE
R1304	ERD25FJ681K	C 680 OHM J 1/4W	RA-	TWH892038	CABLE
R1313	ERD25FJ101K	C 100 OHM J 1/4W	R1	TJS848100	SOCKET
R1315	ERD25FJ271K	C 270 OHM J 1/4W	R2	TJS848100	SOCKET
R1316	ERD25FJ221K	C 220 OHM J 1/4W	S651	TAGDSP301NF	SPARK GAP
R1321	ERD25FJ680K	C 68 OHM J 1/4W	S652	TAGDSP301NF	SPARK GAP
R1322	ERD25FJ181K	C 180 OHM J 1/4W	S653	TAGDSP301NF	SPARK GAP
R1323	ERD25FJ221K	C 220 OHM J 1/4W	S654	TVL407	SPARK GAP
R1324	ERD25FJ122K	C 1.2K OHM J 1/4W			
R1331	ERD25FJ680K	C 68 OHM J 1/4W			
R1332	ERD25FJ181K	C 180 OHM J 1/4W			
R1333	ERD25FJ221K	C 220 OHM J 1/4W			
R1334	ERD25FJ122K	C 1.2K OHM J 1/4W			
R1341	ERD25FJ680K	C 68 OHM J 1/4W			
R1342	ERD25FJ181K	C 180 OHM J 1/4W			
R1343	ERD25FJ221K	C 220 OHM J 1/4W			
R1344	ERD25FJ122K	C 1.2K OHM J 1/4W			
R1352	ERD25FJ102K	C 1K OHM J 1/4W			
R1353	ERD25FJ102K	C 1K OHM J 1/4W			
R1354	ERD25FJ102K	C 1K OHM J 1/4W			
OTHERS					
	TJE81110	TERMINAL			
	TMM85521-1	MARK BAND(1)			
	TMM85521-2	MARK BAND(2)			
	TMM85521-3	MARK BAND(3)			
	TMM85521-4	MARK BAND(4)			
	TMM85521-5	MARK BAND(5)			
	TMM85521-6	MARK BAND(6)			
	TMM85521-7	MARK BAND(7)			
	TQF85280	FUSE LABEL			
	TUX80701-2	CORD BRACKET (BIG)			
	TUX80971	CORD BRACKET			
	TUX85452	IF BRACKET			
	TXAJTE3P908	3P CONNECTOR ASSY			
	XTB4+8C	SCREW			
	XTV3+12A	SCREW			